



CCAFS site atlas

Borana / Yabero Ethiopia

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

Site Atlas

Correct citation:

Sijmons K., Kiplimo J., Förch W., Thornton P.K., Radeny, M. and Kinyangi, J. (2013). CCAFS Site Atlas – Borana / Yabero. CCAFS site atlas series. The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org

Titles in this series aim to disseminate interim climate change, agriculture and food security research and practices and stimulate feedback from the scientific community.

This document is published by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) which is a strategic partnership between CGIAR and Future Earth. CCAFS is supported by the CGIAR Fund, the Danish International Development Agency (DANIDA), the Australian Government Overseas Aid Program (AusAid), Irish Aid, Environment Canada, the Ministry of Foreign Affairs for the Netherlands, the Swiss Agency for Development and Cooperation (SDC), Instituto de Investigação Científica Tropical (IICT), UK Aid, the Government of Russia, and the European Union (EU). The Program is carried out with technical support from the International Fund for Agricultural Development (IFAD)

Contact:

CCAFS Coordinating Unit - Faculty of Science, Department of Plant and Environmental Sciences, University of Copenhagen, Rolighedsvej 21, DK-1958 Frederiksberg C, Denmark. Tel: +45 35331046; Email: ccaafs@cgiar.org

Creative Commons License



This Atlas is licensed under a Creative Commons Attribution – NonCommercial–NoDerivs 3.0 Unported License.

Articles appearing in this publication may be freely quoted and reproduced provided the source is acknowledged. No use of this publication may be made for resale or other commercial purposes.

©2013 CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

DISCLAIMER:

This Atlas Series has been prepared as an output for Theme 4.2 under the CCAFS program and has not been peer reviewed. Any opinions stated herein are those of the author(s) and do not necessarily reflect the policies or opinions of CCAFS, donor agencies, or partners. The geographic designation employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of CCAFS concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

All images remain the sole property of their source and may not be used for any purpose without written permission of the source.

Contents

Chapter 1: Introduction	iv
Regional Map.....	1
Topographic Map	2
Satellite Map	3
Chapter 2: Climate and Climate Variability	
Annual Rainfall	4
Annual Temperature	5
Aridity Index	6
Chapter 3: Bio-Physical Characteristics	
Altitude	7
Soil Type	8
Agro-Ecological Zones	9
Landcover	10
Landuse	11
Length of Growing Period 2000	12
Length of Growing Period 2030	13
Crop Suitability	14

Livestock Production Systems	15
Livestock Density	16
Chapter 4: Socio-Economic Factors	
Livelihood Zones.....	17
Human Population Density	18
Market Access	19
Poverty	20
Conservations Areas.....	21
References and Data Sources	22

Introduction

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) seeks to promote a food-secure world through the provision of science-based efforts that support sustainable agriculture and enhance livelihoods while adapting to climate change and conserving natural resources and environmental services.

Climate change is an unprecedented threat to the food security of hundreds of millions of people who depend on small-scale agriculture for their livelihoods. Climate change affects agriculture and food security, and likewise, agriculture and natural resource management affect the climate system.

CCAFS has initially focused on three regions; East Africa (EA), West Africa (WA) and South Asia (SA) to carry out its research. The 15 CCAFS sites in these areas represent areas that are becoming both drier and wetter, and are focal locations that will generate results that can be applied and adapted to other regions worldwide. In this year, 2013, CCAFS is expanding its portfolio to additional sites in Latin America and South-East Asia.

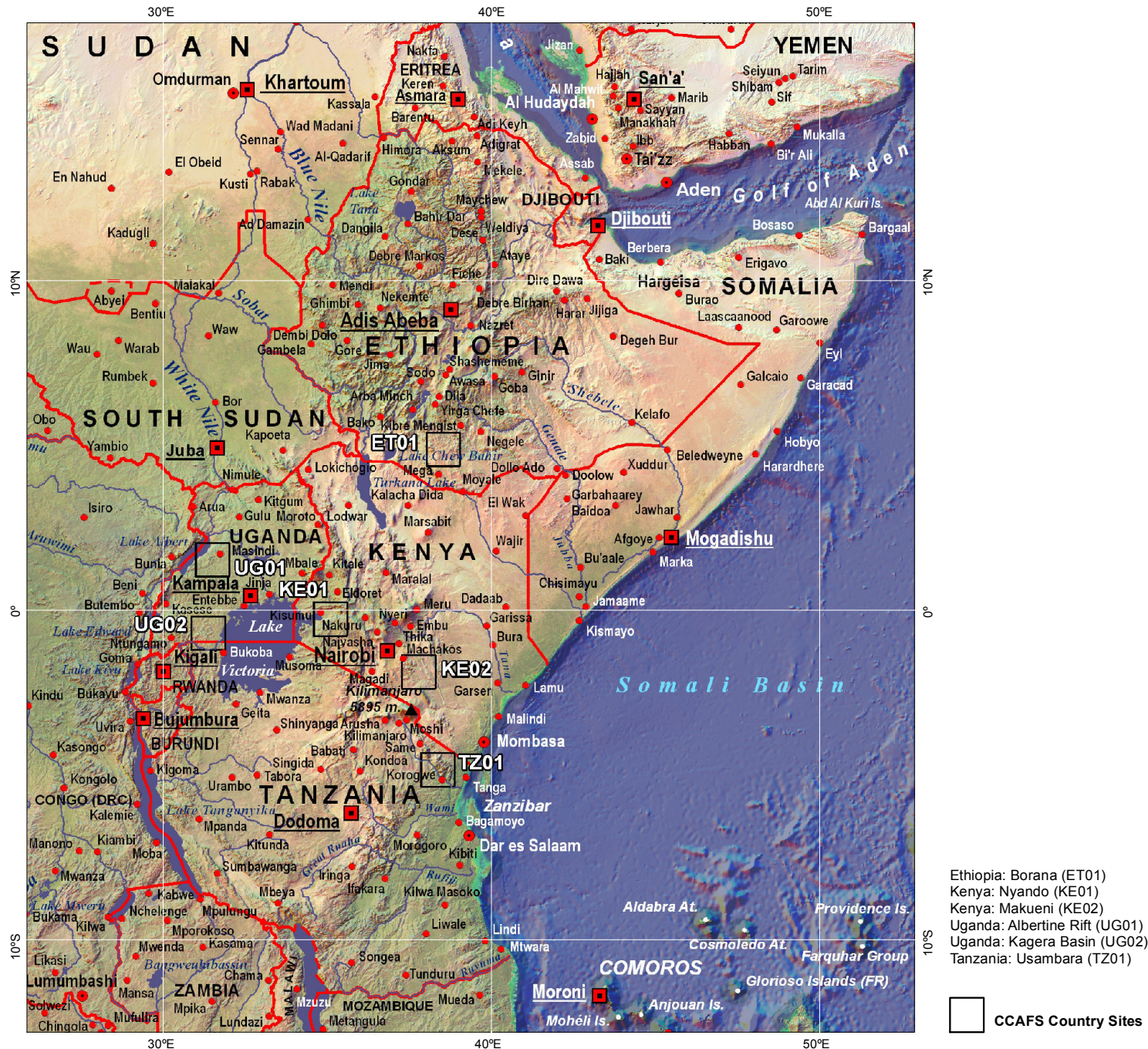
These sites serve as the initial focus of CCAFS partnership-building and long-term research activities falling within the following CCAFS Research Themes; Adaptation to Progressive Climate Change, Adaptation through Managing Climate Risk, Pro-Poor Climate Change Mitigation and Integration for Decision Making. At all 15 CCAFS sites, baseline surveys have been conducted, including three levels of data collection and analysis at household, village and organizational levels (see: <http://ccaafs.cgiar.org/resources/baseline-surveys>).

More information on CCAFS work in all the three regions can be accessed at www.ccaafs.cgiar.org

To better understand the CCAFS sites' characteristics, a list of geospatial indicators for climate variability, bio-physical characteristics and socio-economic variables have been mapped into site atlases.

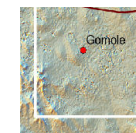
This Atlas was developed for the CCAFS site at Borana / Yabero in Ethiopia, in East Africa Region.

CCAFS Sites: East Africa



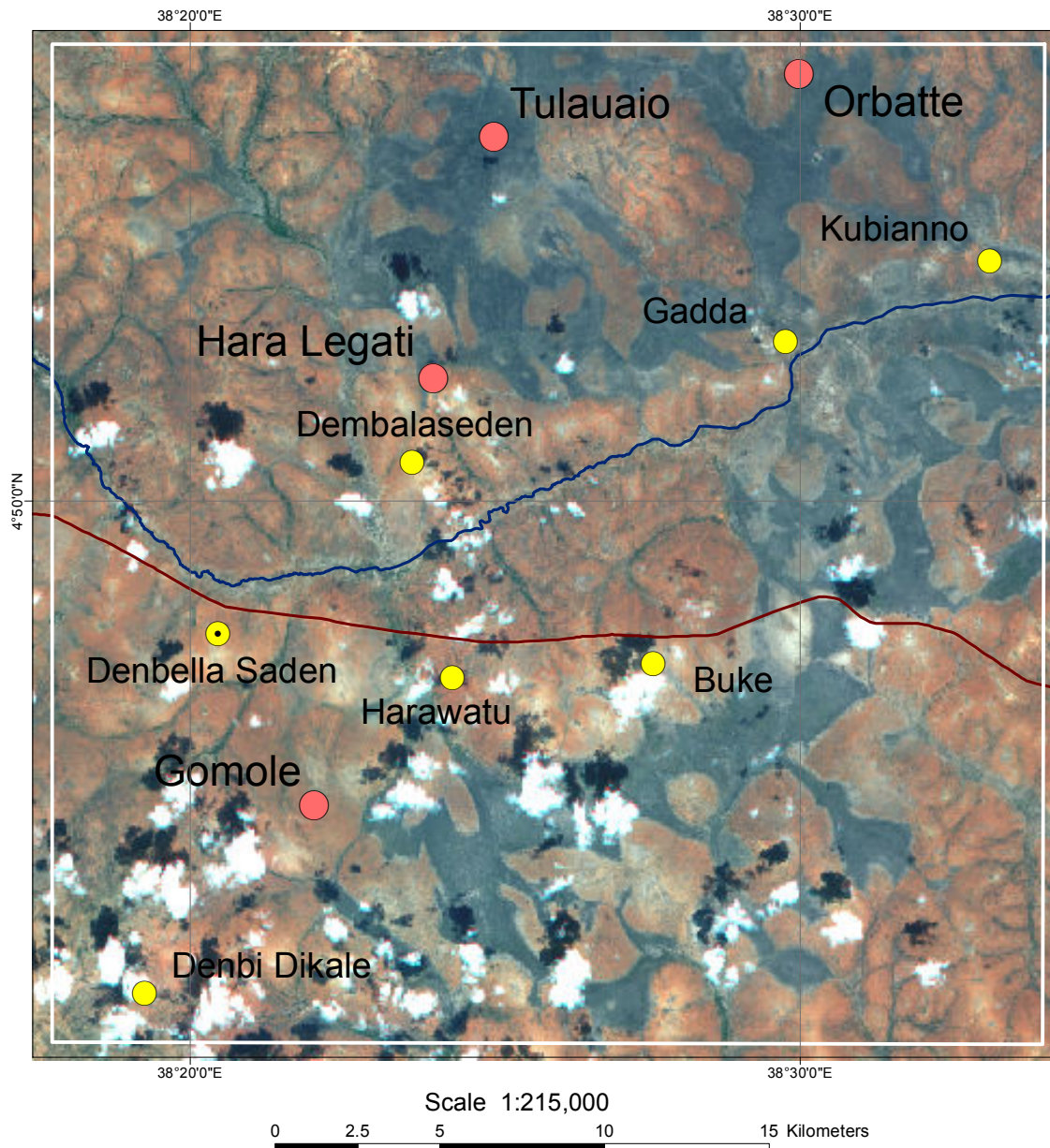
Topography Borana

CCAFS Site ET01, Borana / Yabero, Ethiopia



Sampling frame size: 30km x 30km

Satellite Image Yabero



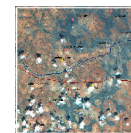
RapidEye imagery from 01-04-2011
at 5m ground resolution

HBS= Household Baseline
Survey

VBS= Village Baseline
Survey

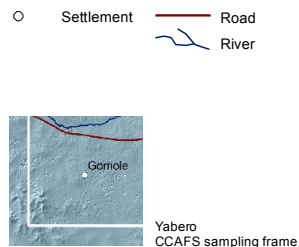
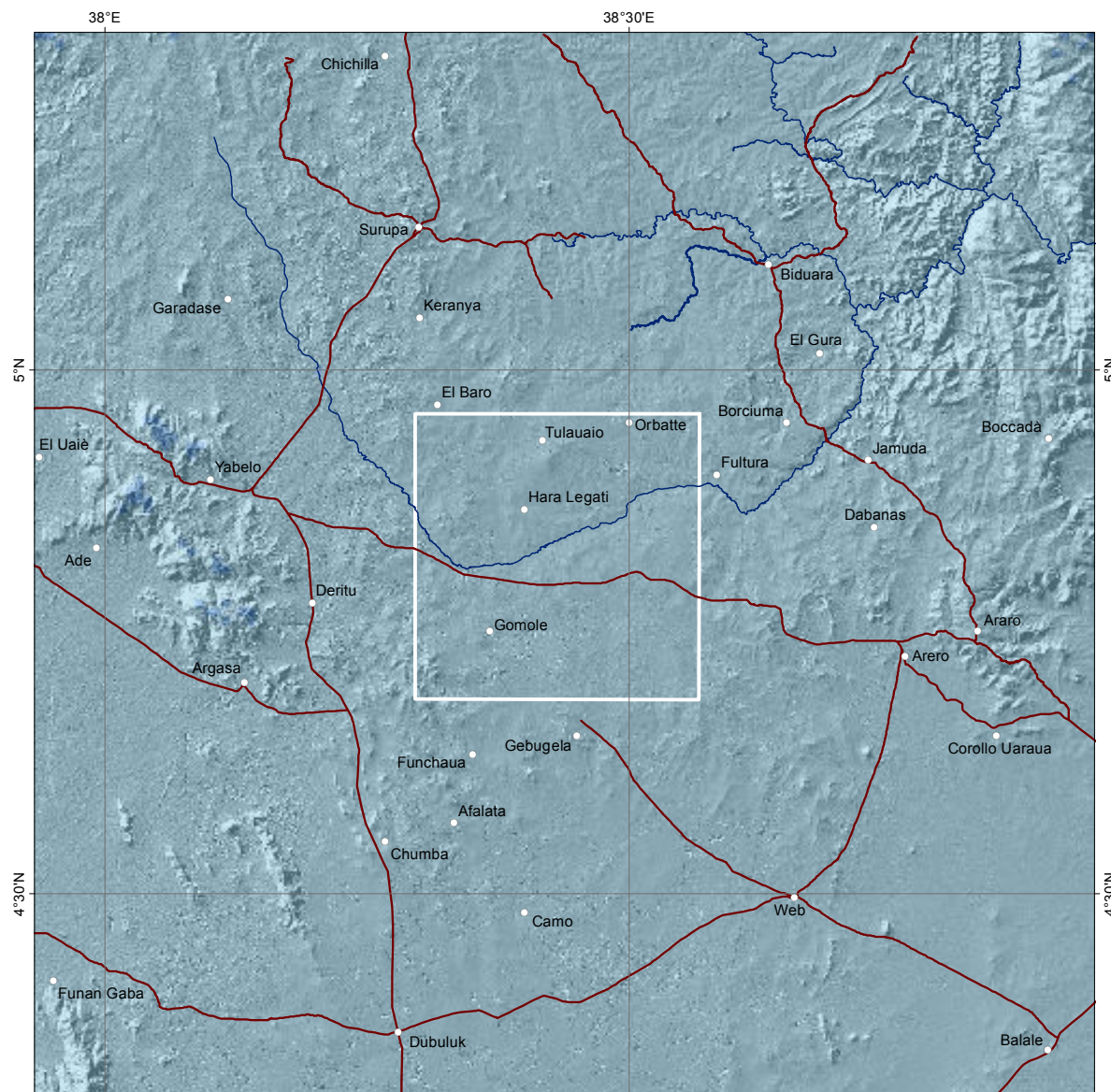
OBS= Organizational Baseline
Survey

- Road
- River
- Settlement
- CCAFS VBS/OBS village
- CCAFS HBS villages



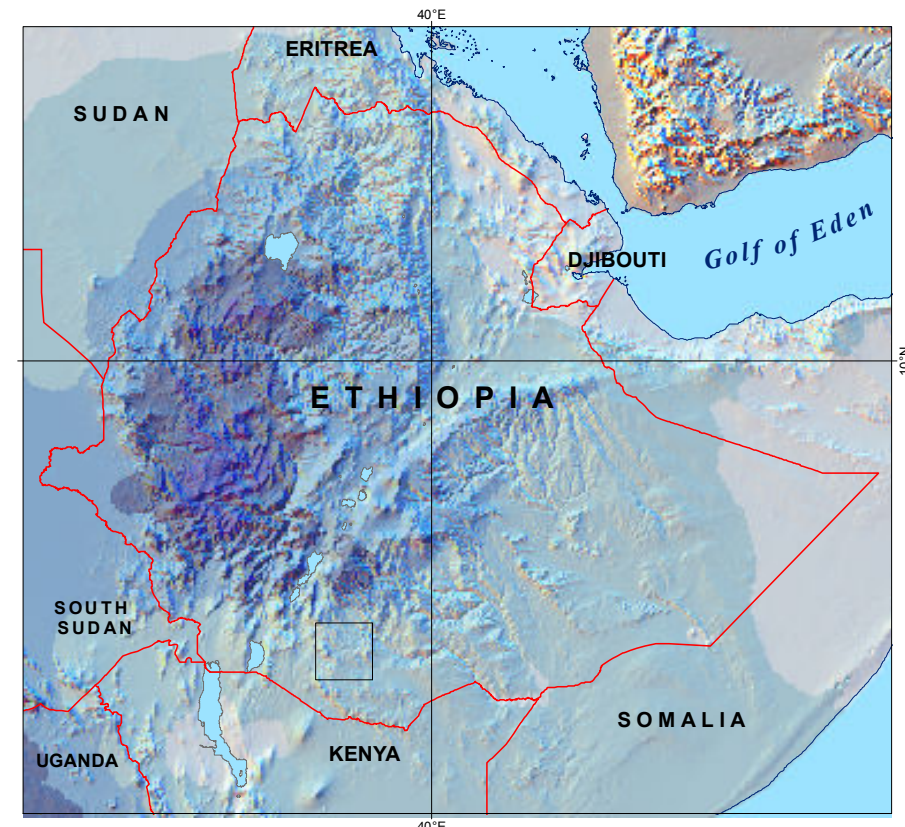
CCAFS Baseline
Sampling Frame

Annual Rainfall



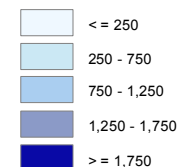
Scale 1:750,000
1 cm = 7.5 km

Annual Rainfall data of current interpolations of observed data, representative of 1950 - 2000

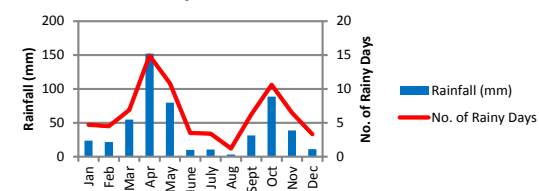


International boundary
Corresponds to the map on the left
Scale 1:15,000,000
0 125 250 500 Kilometers

Rainfall (mm)



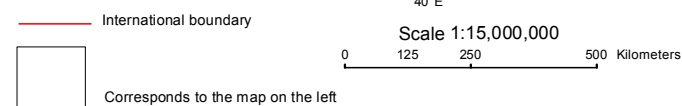
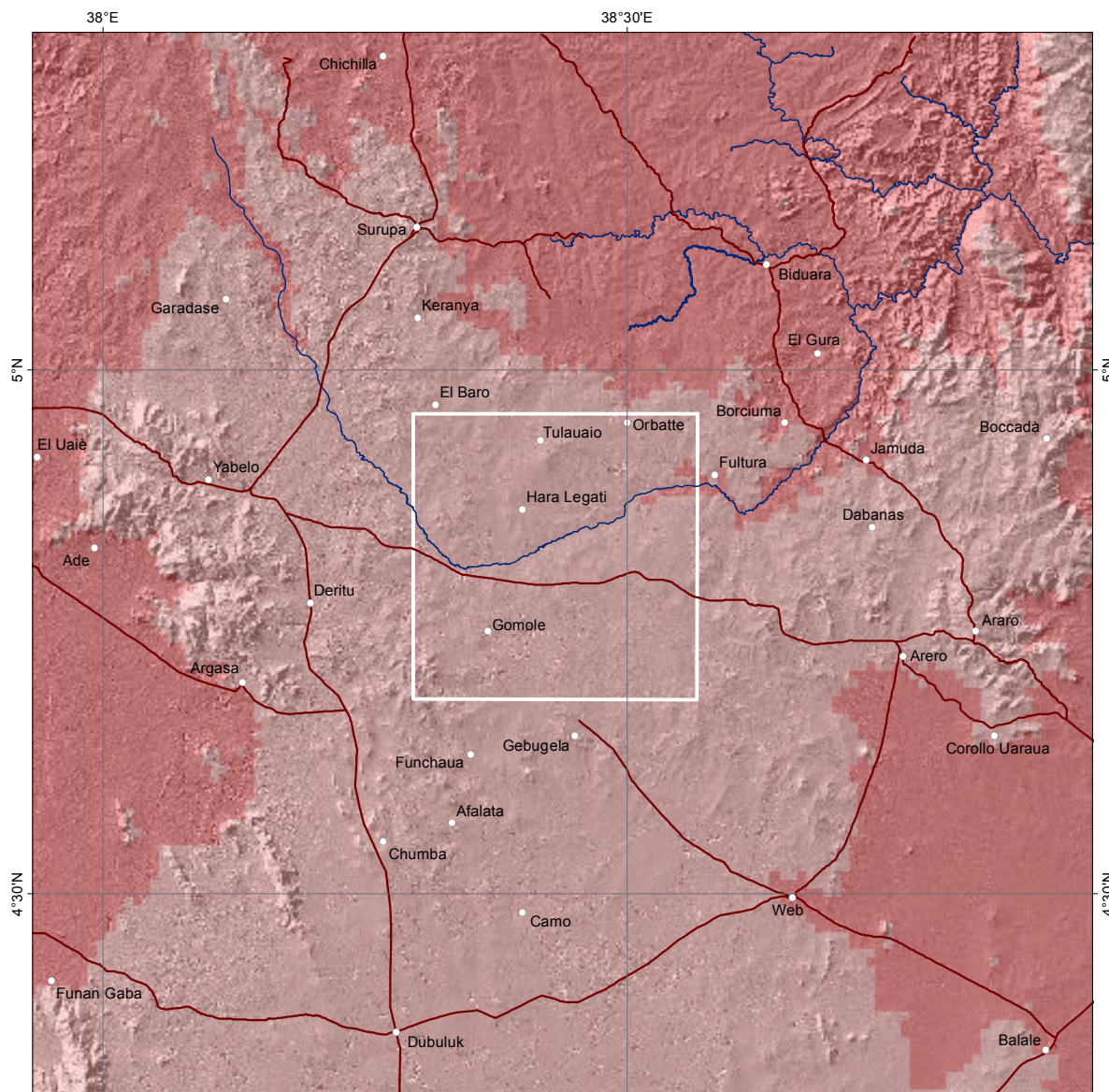
Yabero Mean Monthly Rainfall Distribution



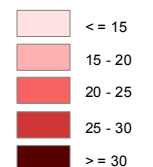
Citation: Jones et al (2002)

Citation: Hijmans et al (2005)

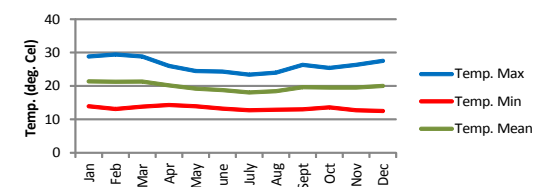
Annual Temperature



Temperature (°C)



Yabero Mean Monthly Temperature Distribution

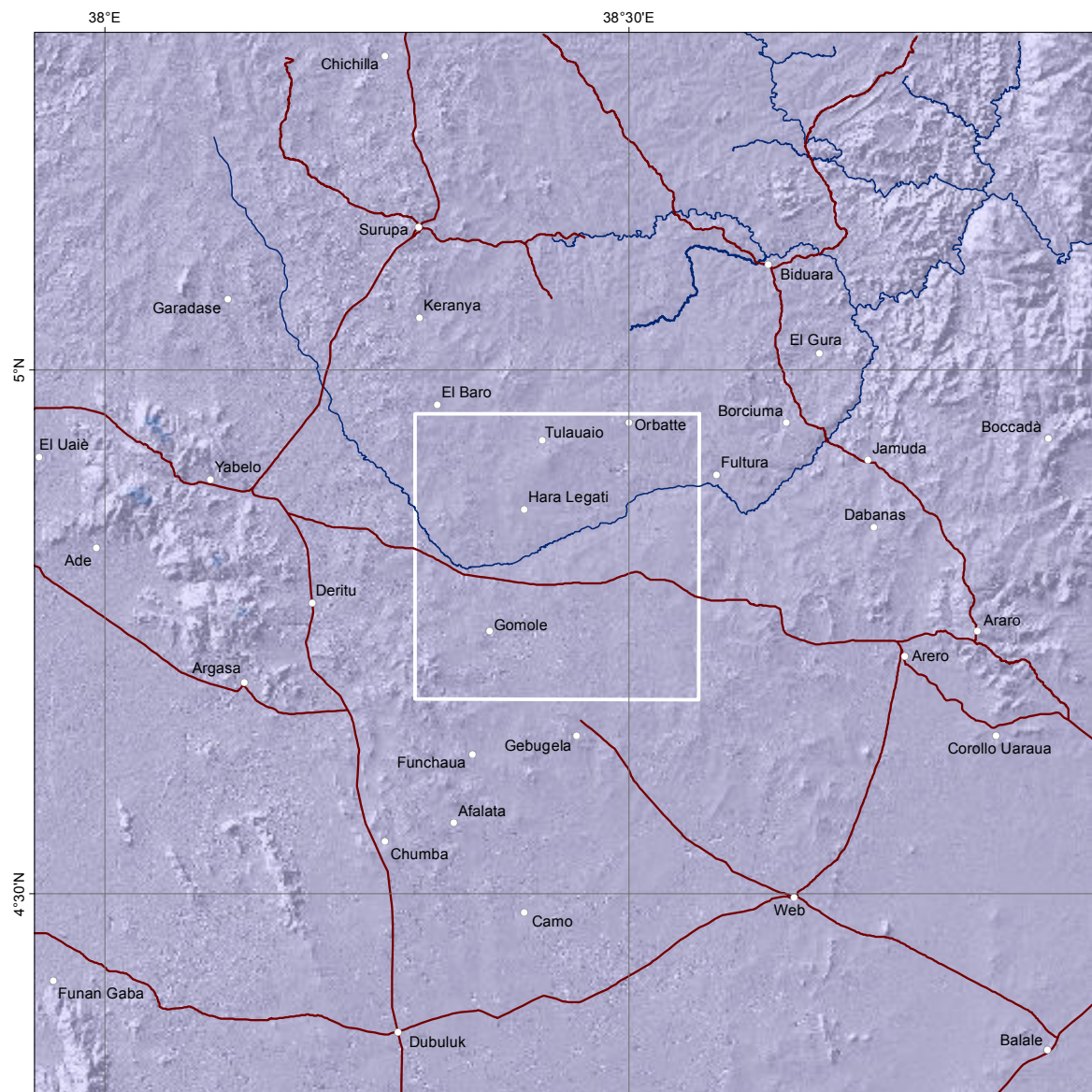


Citation: Jones et al (2002)

Annual Temperature represents annual temperature data of current interpolations of observed data, averaged for 1950 - 2000

Citation: Hijmans et al (2005)

Aridity Index

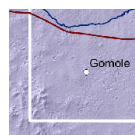


○ Settlement
— Road
— River

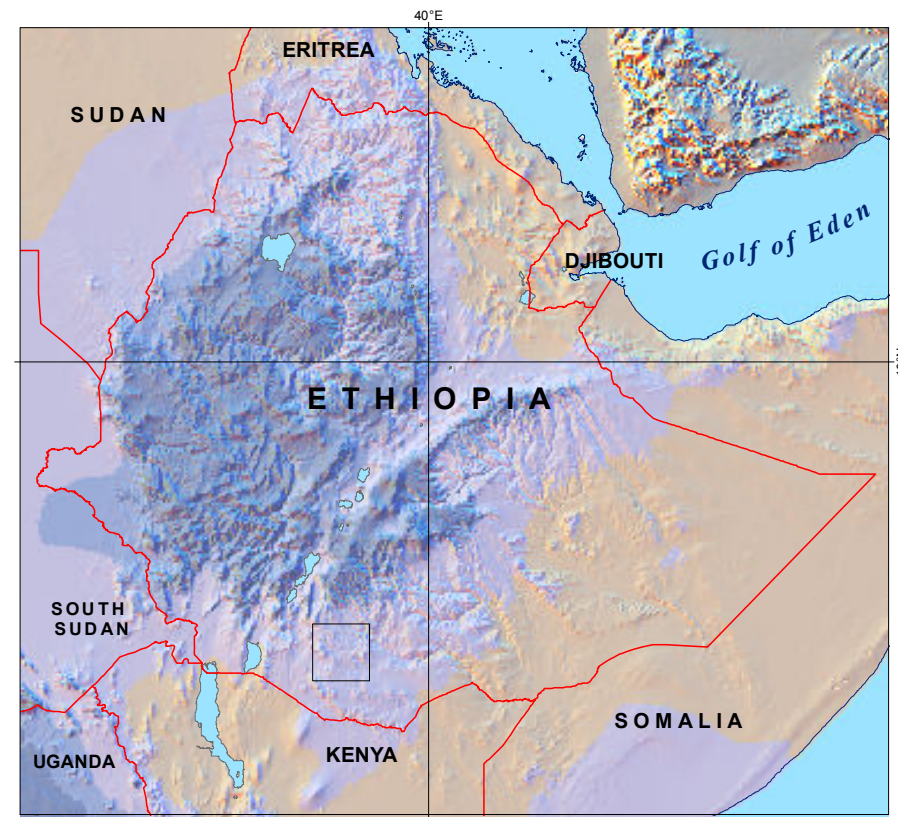
Scale 1:750,000

0 7.5 15 30 45 Kilometers

1 cm = 7.5 km



Yabero CCAFS sampling frame



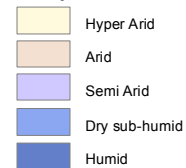
— International boundary

Scale 1:15,000,000

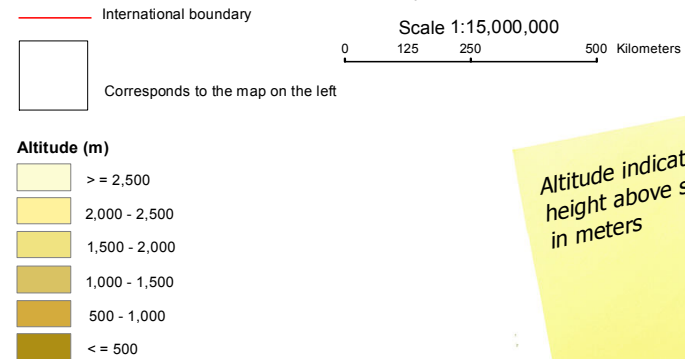
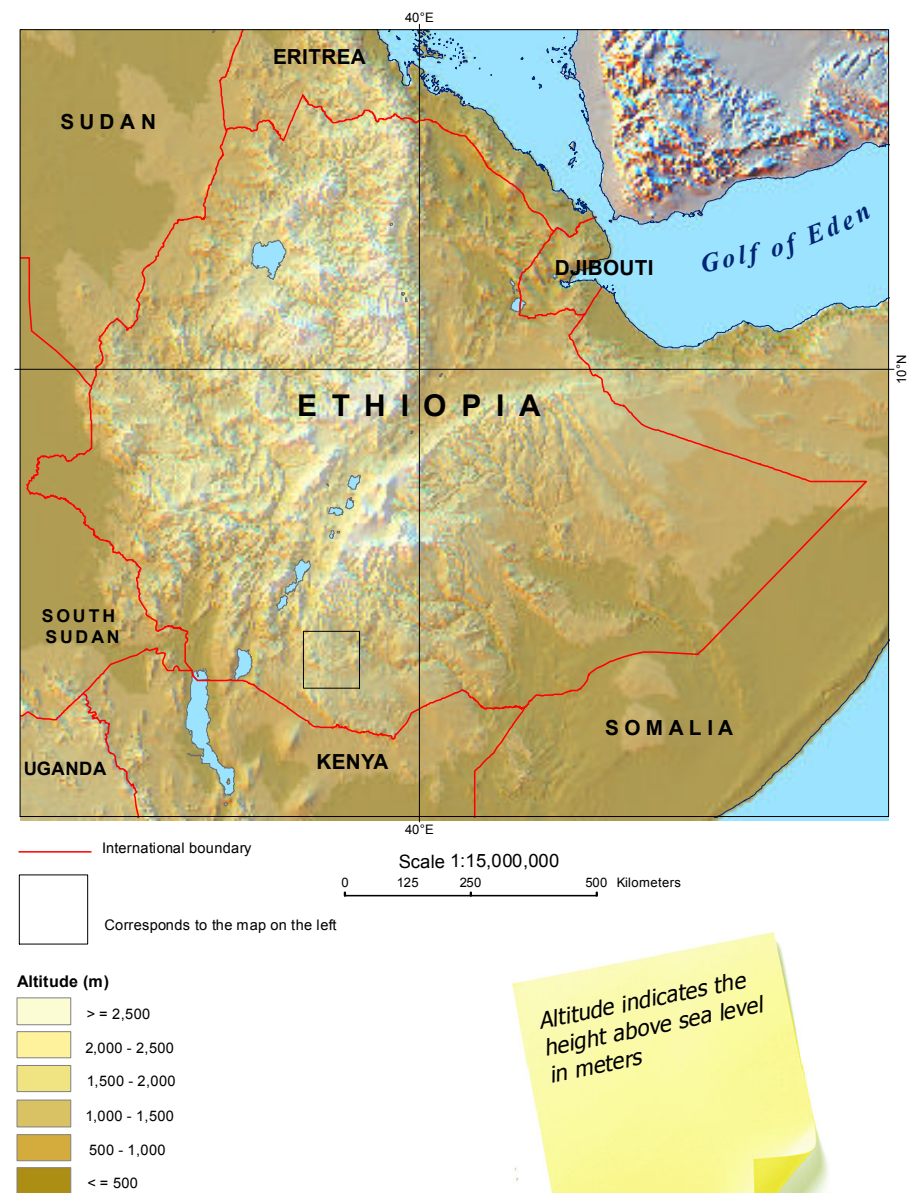
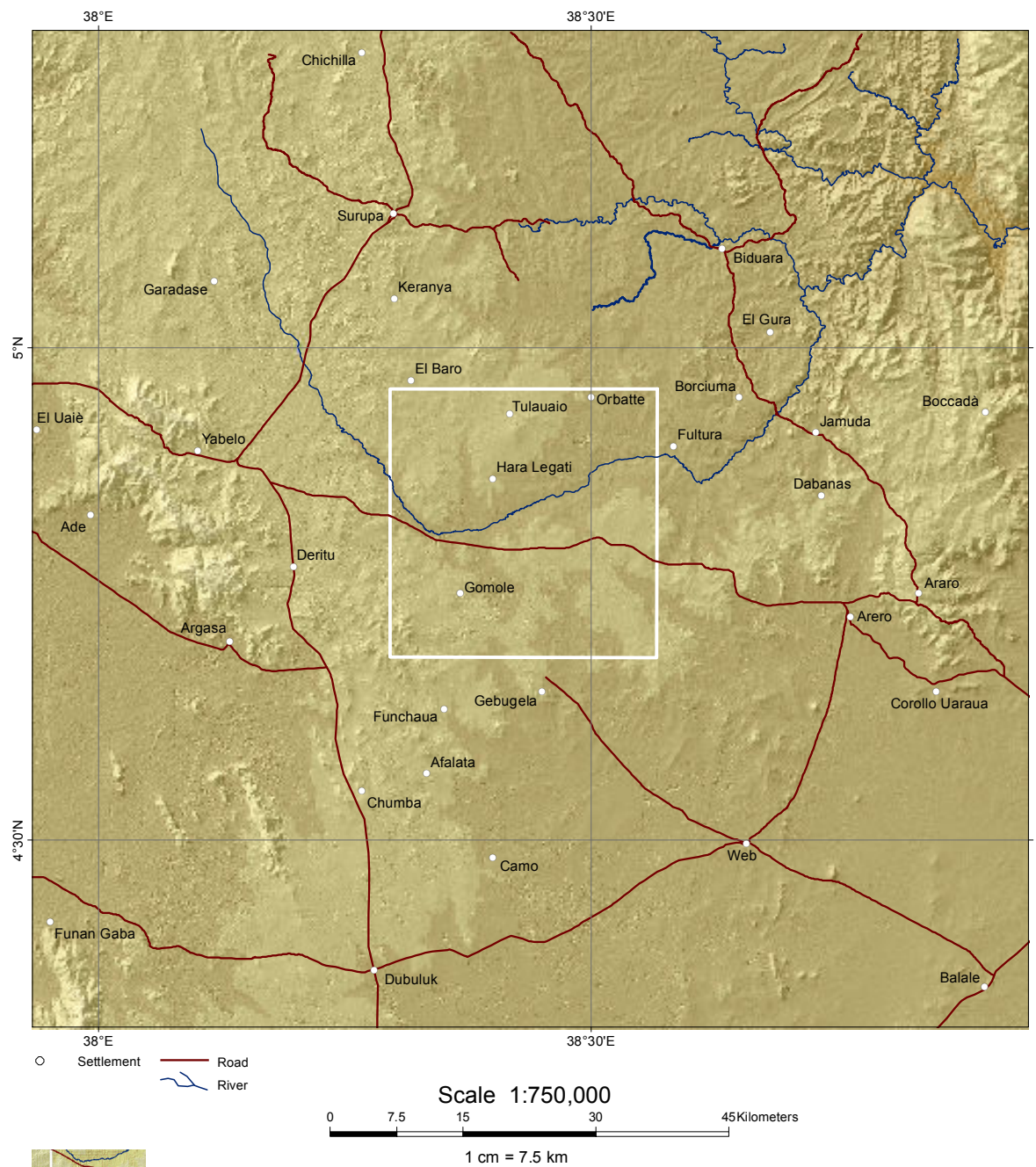
0 125 250 500 Kilometers

□ Corresponds to the map on the left

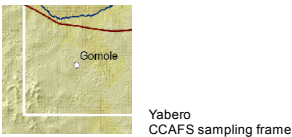
Aridity Index

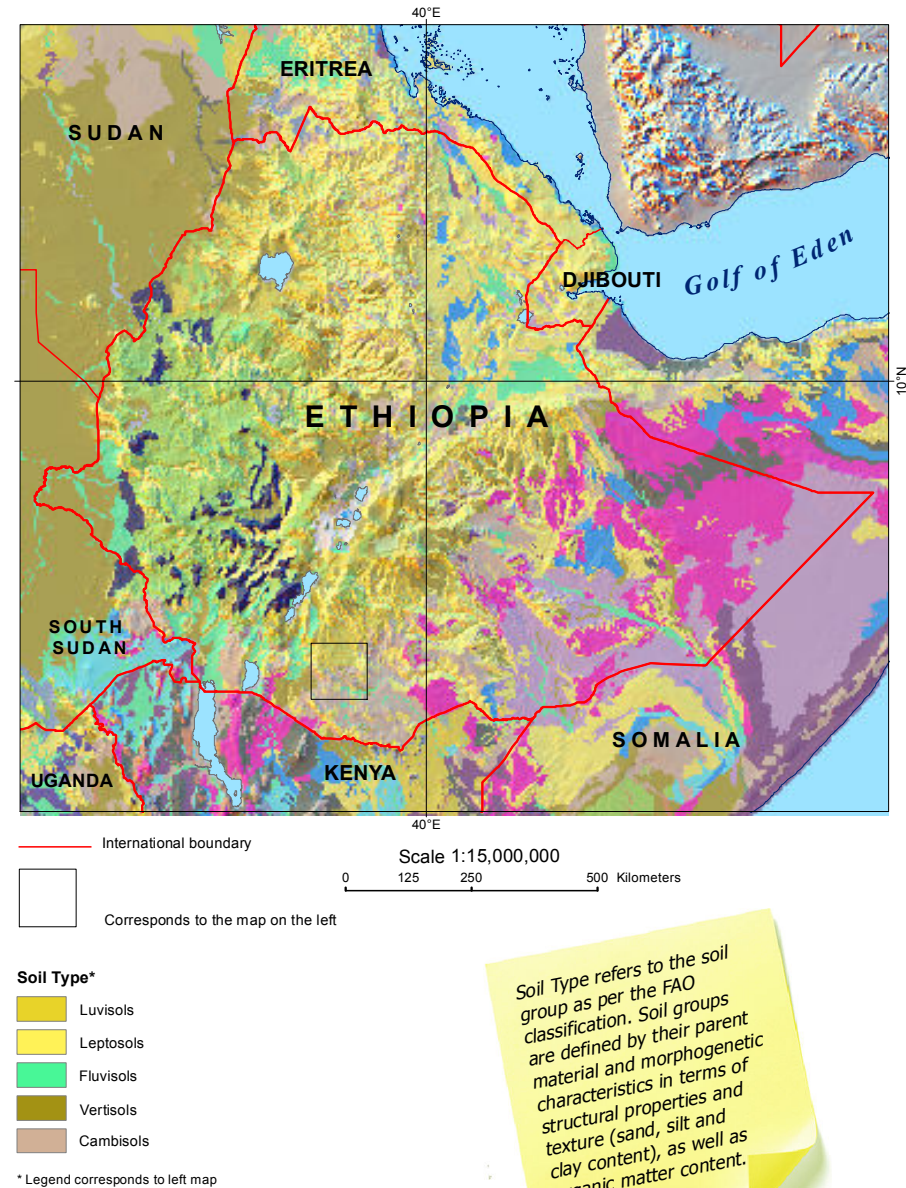
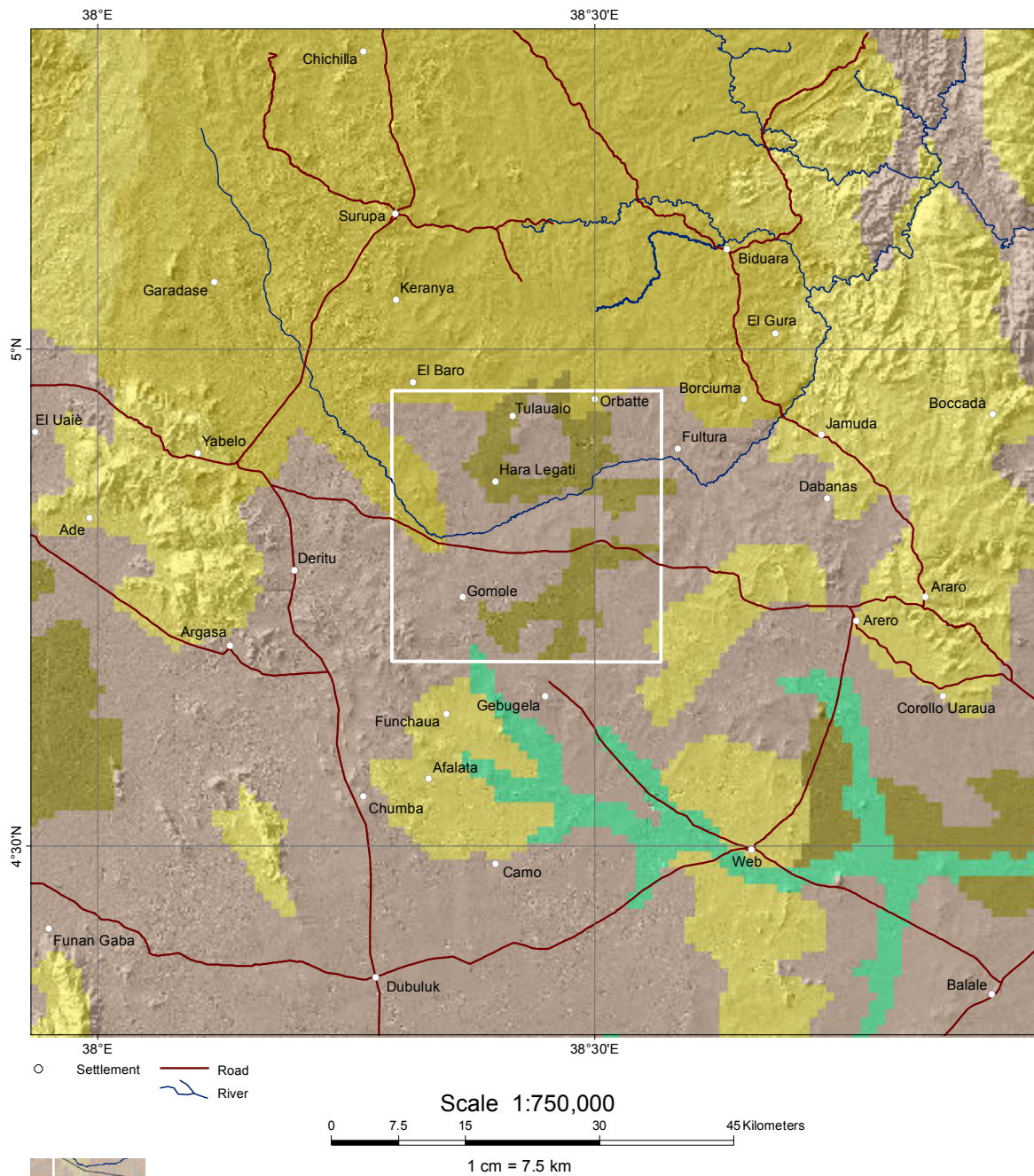


Aridity Index indicates the level of dryness, taking evapotranspiration into account, at a given location of known rainfall



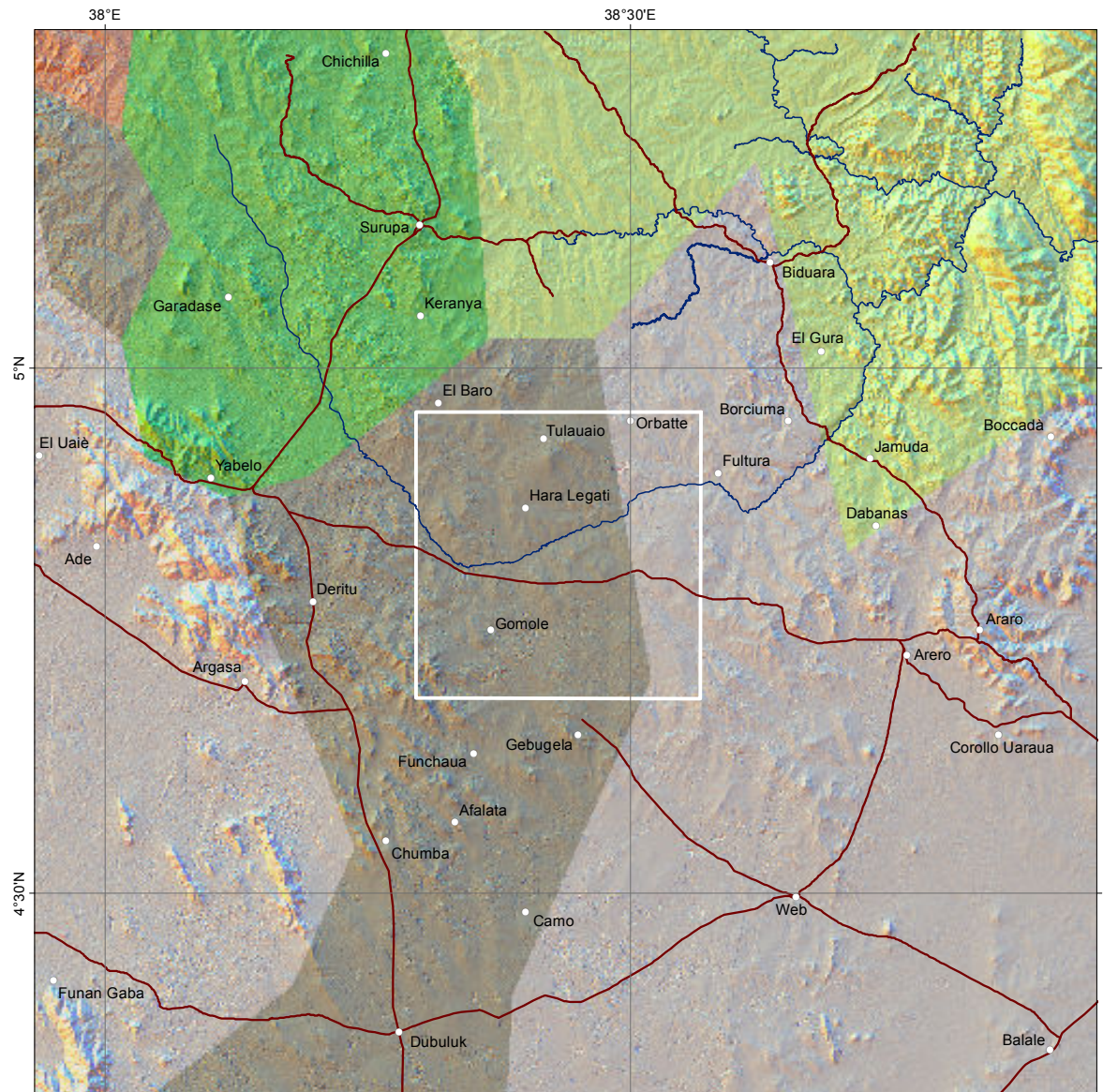
Altitude indicates the height above sea level in meters





Soil Type refers to the soil group as per the FAO classification. Soil groups are defined by their parent material and morphogenetic characteristics in terms of structural properties and texture (sand, silt and clay content), as well as organic matter content.

Agro-Ecological Zones



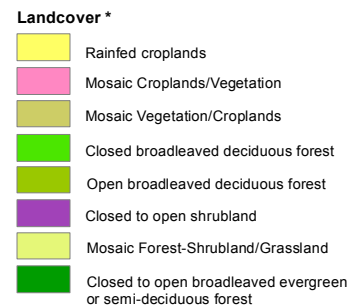
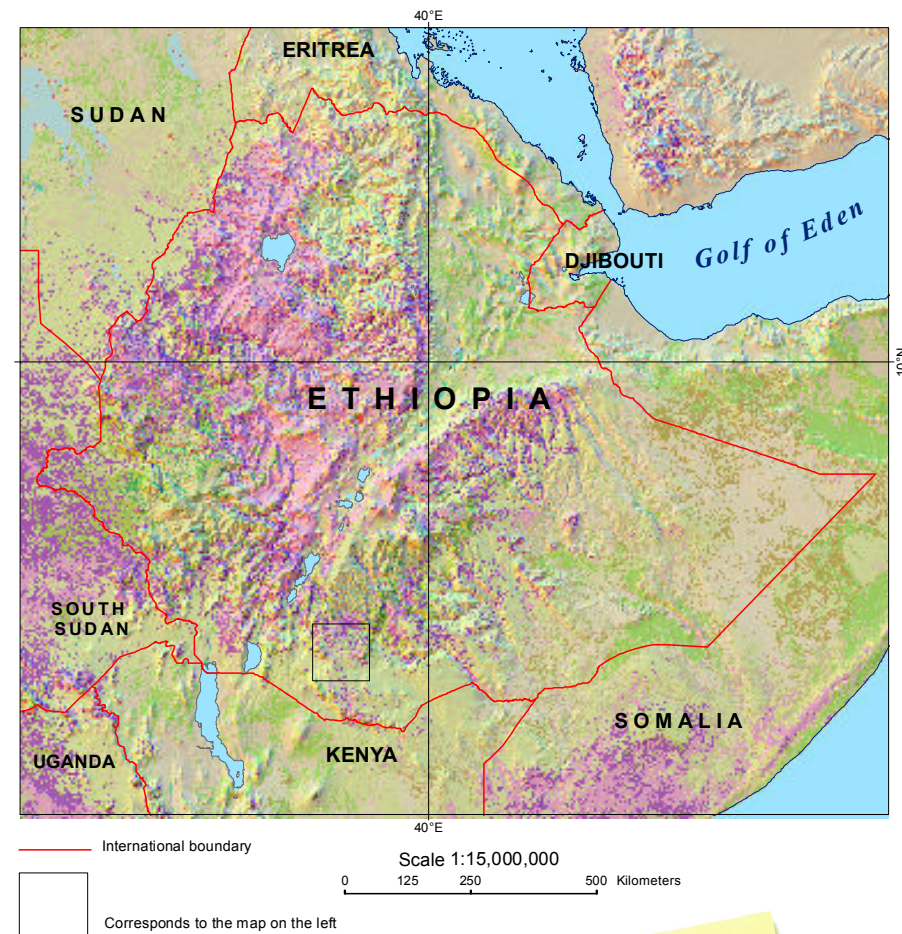
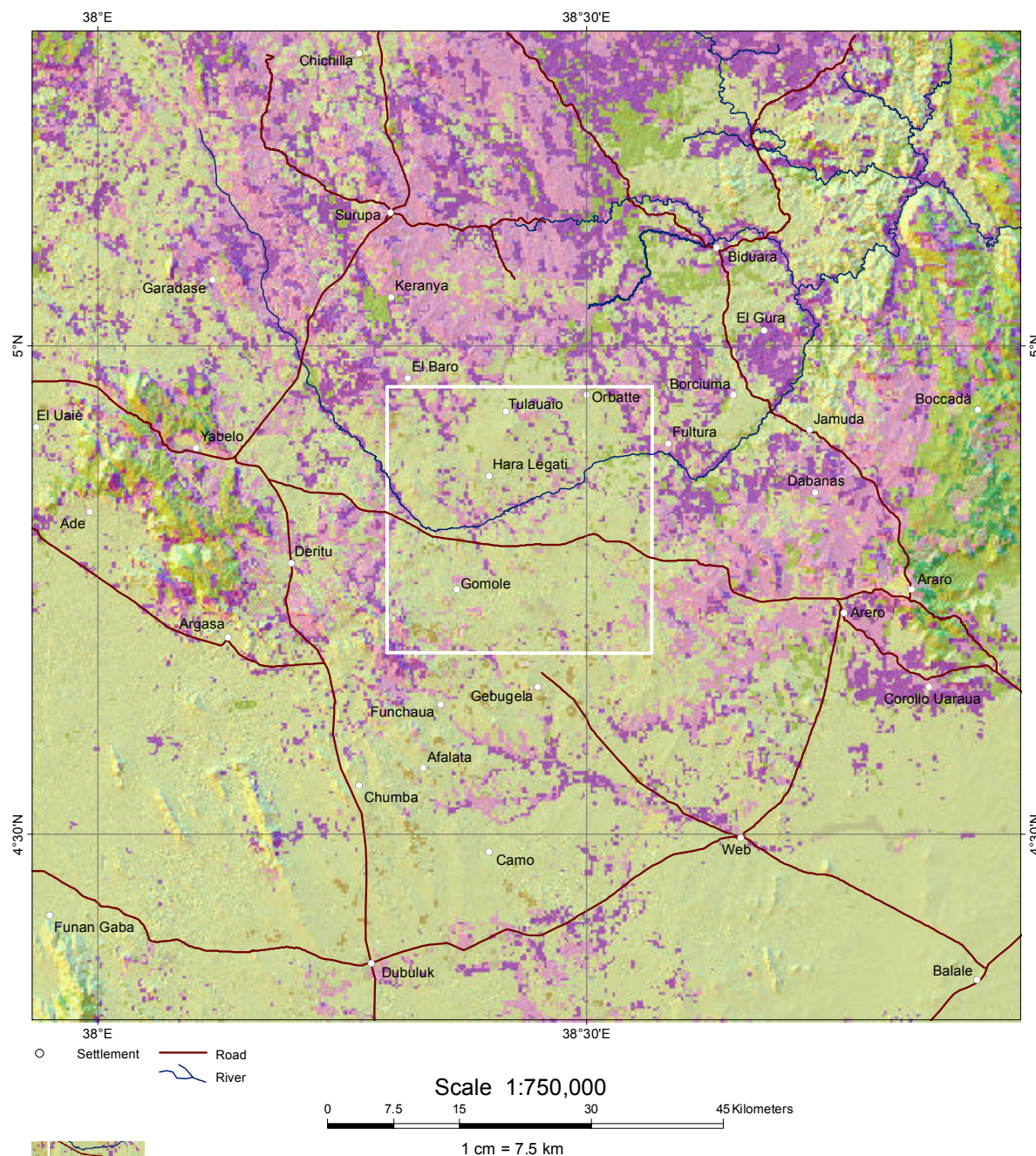
International boundary
Scale 1:15,000,000
0 125 250 500 Kilometers
Corresponds to the map on the left

Agro-Ecological Zones*

- High Altitude Semi-Arid
- High Altitude Northern Guinea Savanna
- High Altitude Southern Guinea Savanna
- Mid Altitude Northern Guinea Savanna
- Mid Altitude Semi-Arid

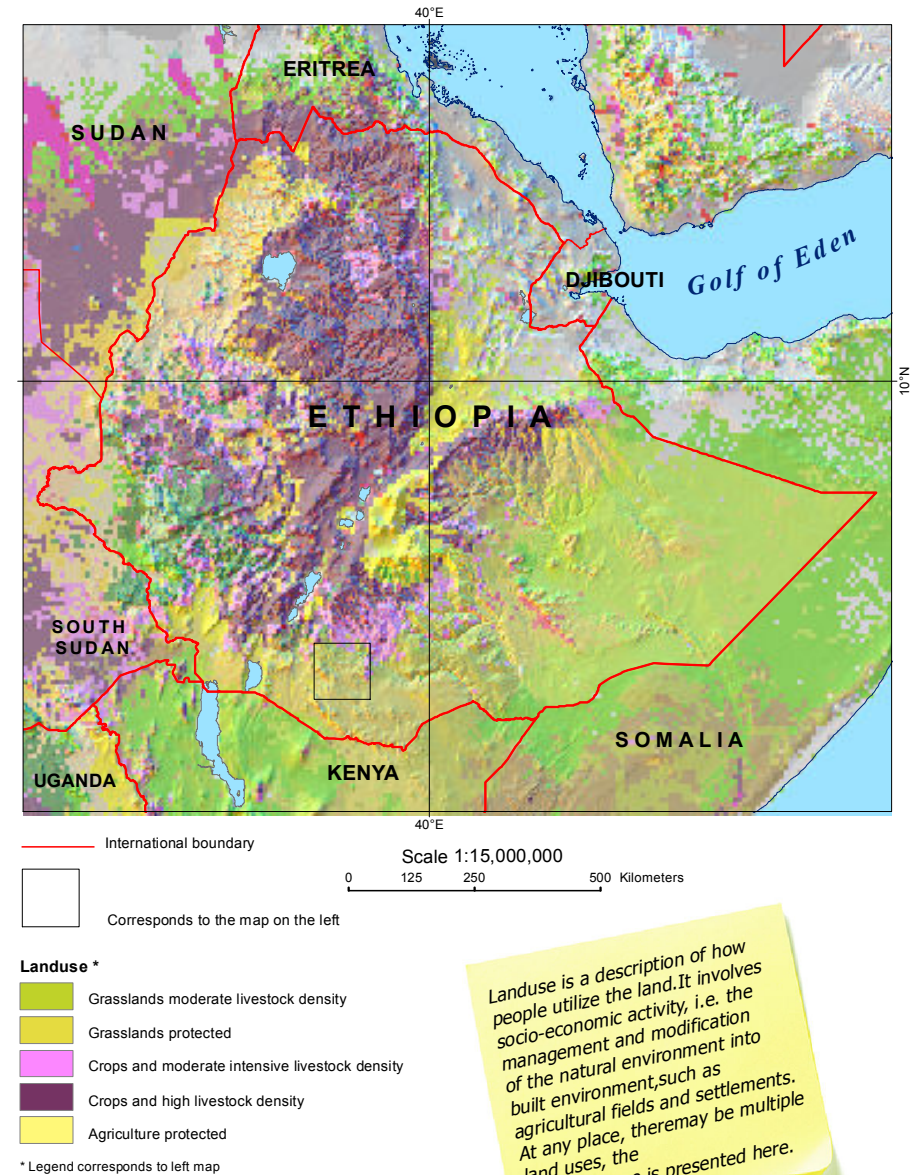
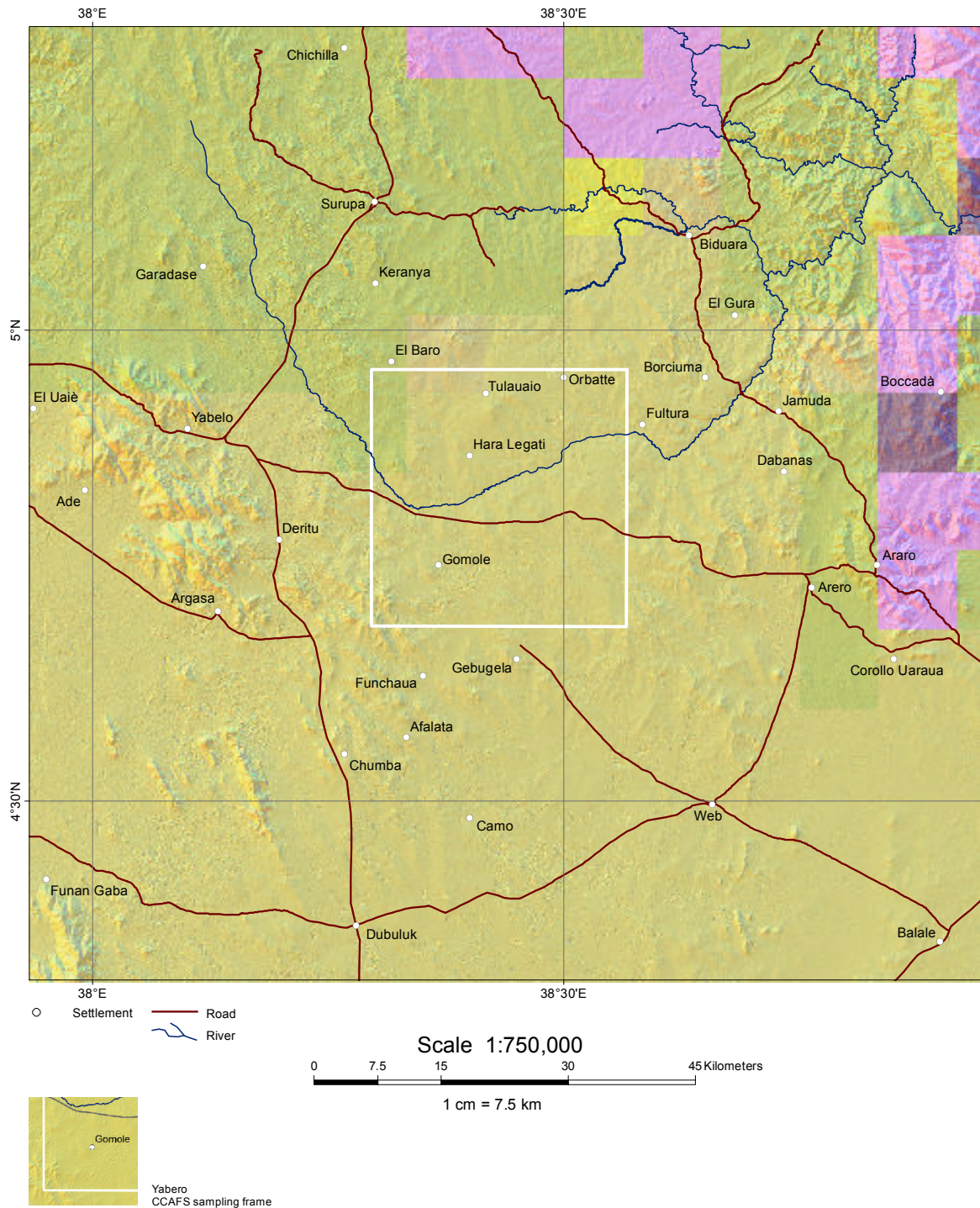
* Legend corresponds to left map

Agro-Ecological Zones indicate the division of land areas that have similar characteristics related to land suitability, potential agricultural production and environmental impact.



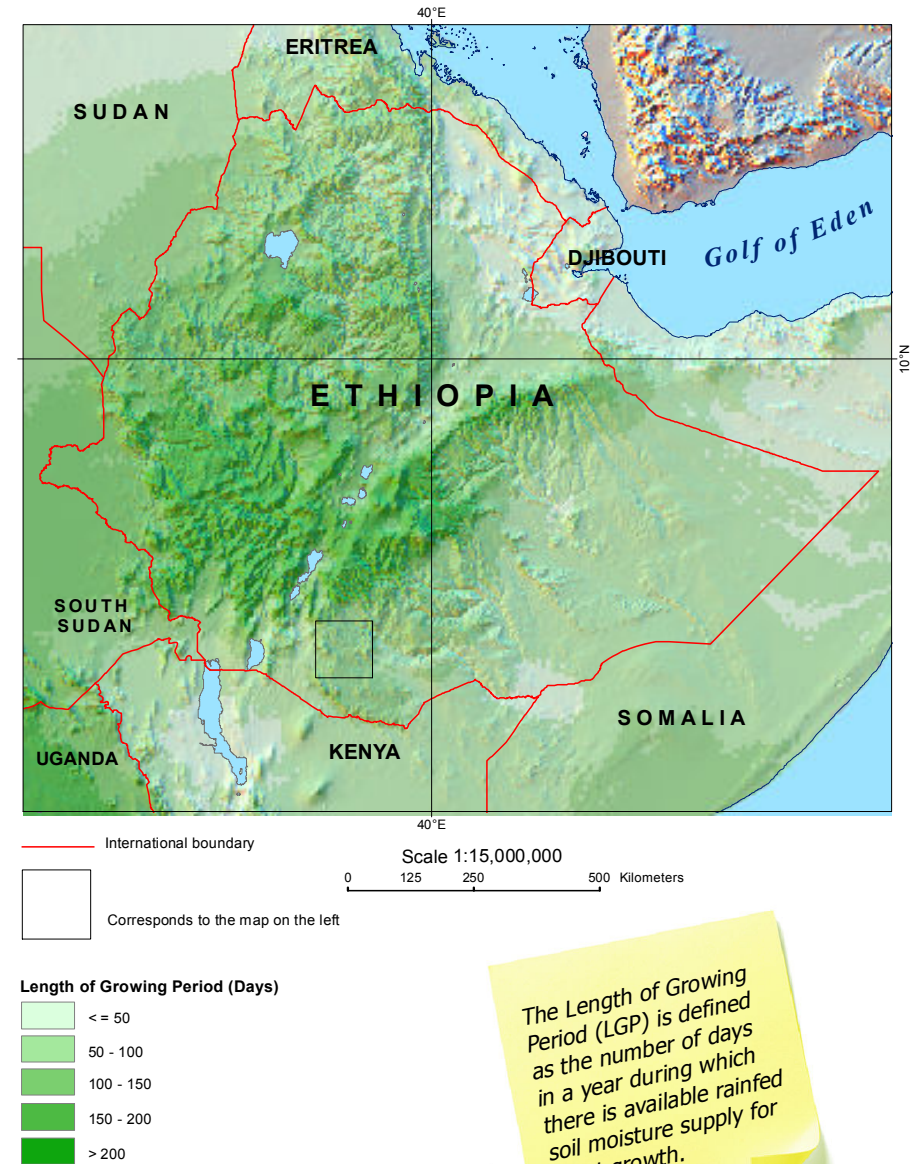
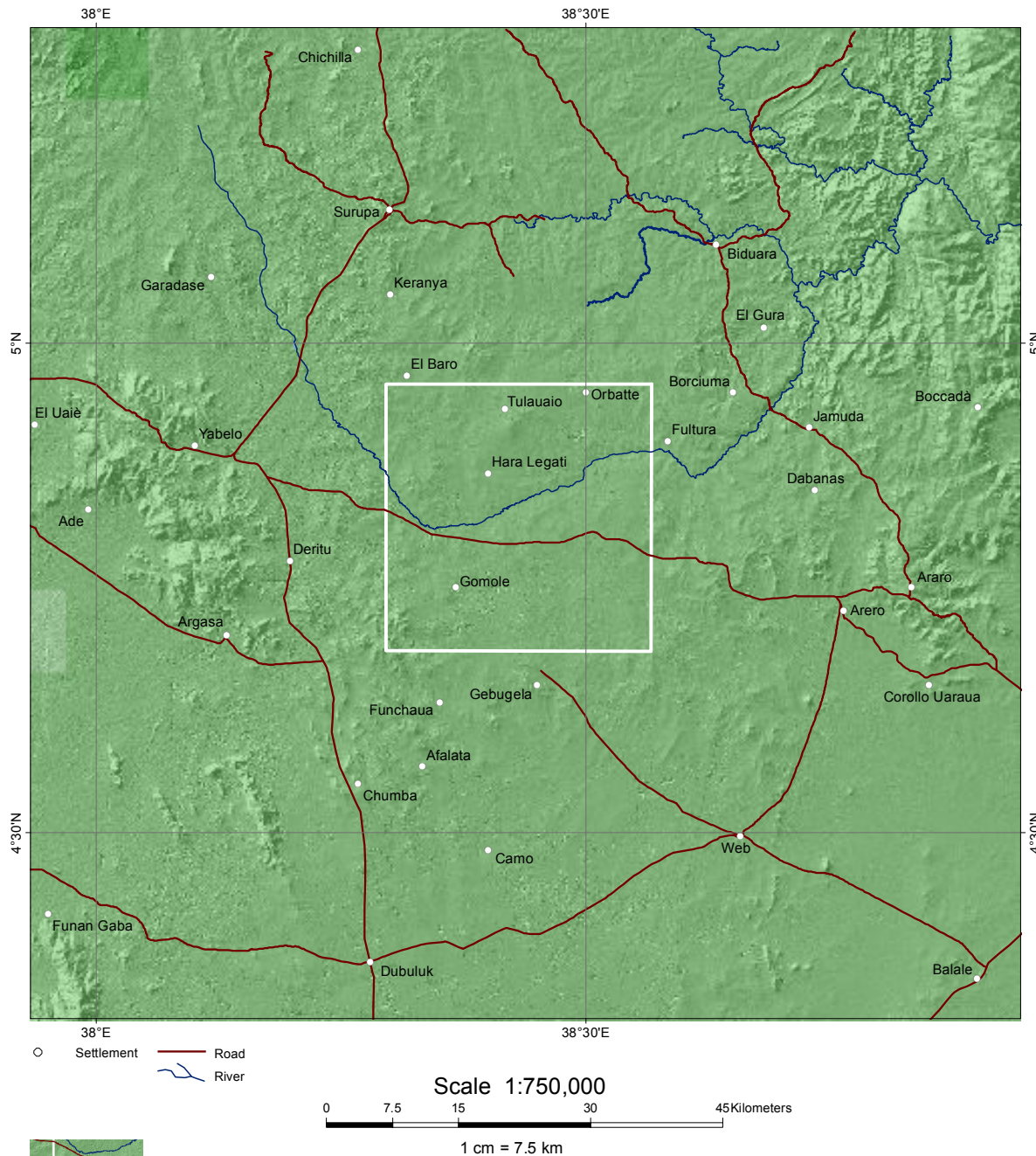
* Legend corresponds to left map

Landcover shows the observed (bio)physical cover of the earth's surface, i.e. dominant vegetation, land use and man-made features.



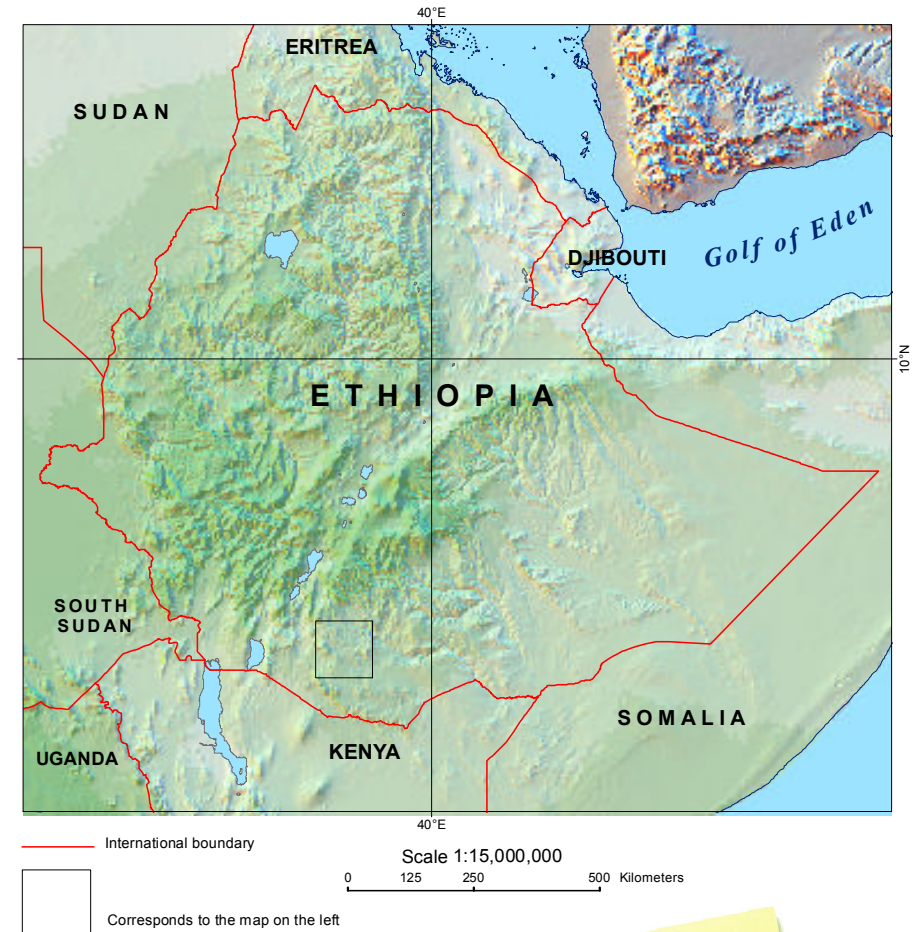
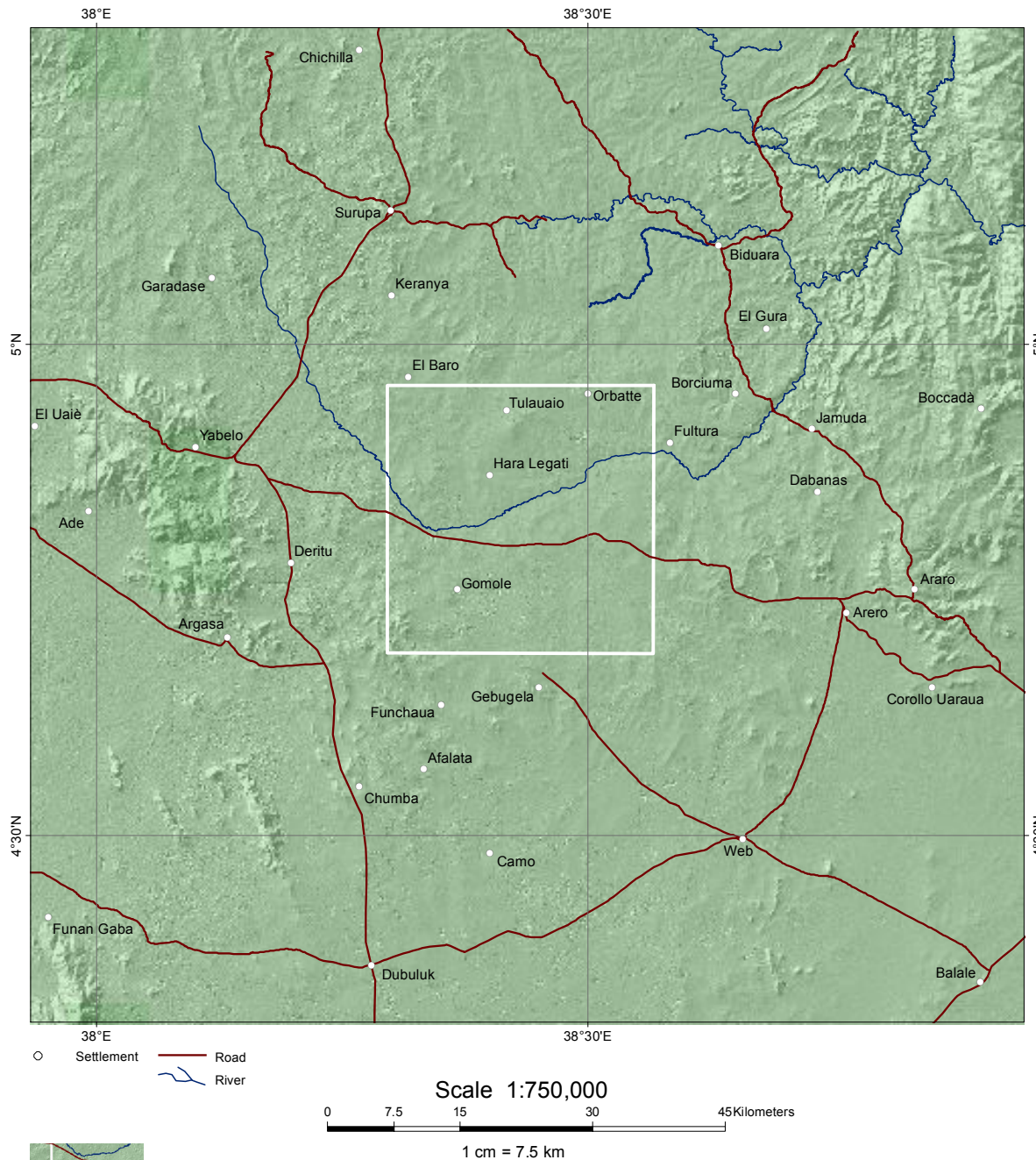
Landuse is a description of how people utilize the land. It involves socio-economic activity, i.e. the management and modification of the natural environment into built environment, such as agricultural fields and settlements. At any place, there may be multiple land uses, the dominant one is presented here.

Length of Growing Period 2000

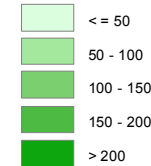


The Length of Growing Period (LGP) is defined as the number of days in a year during which there is available rainfed soil moisture supply for plant growth.

Length of Growing Period 2030

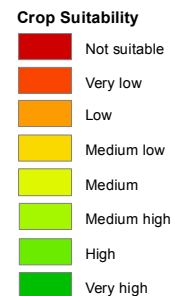
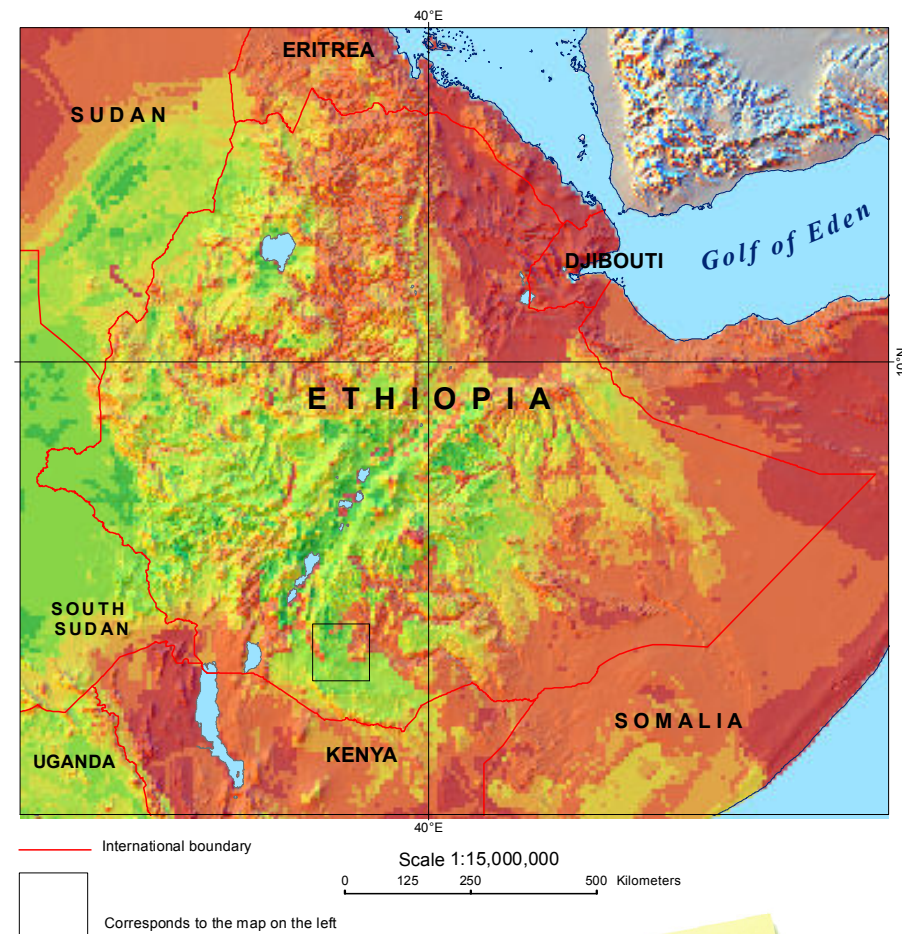
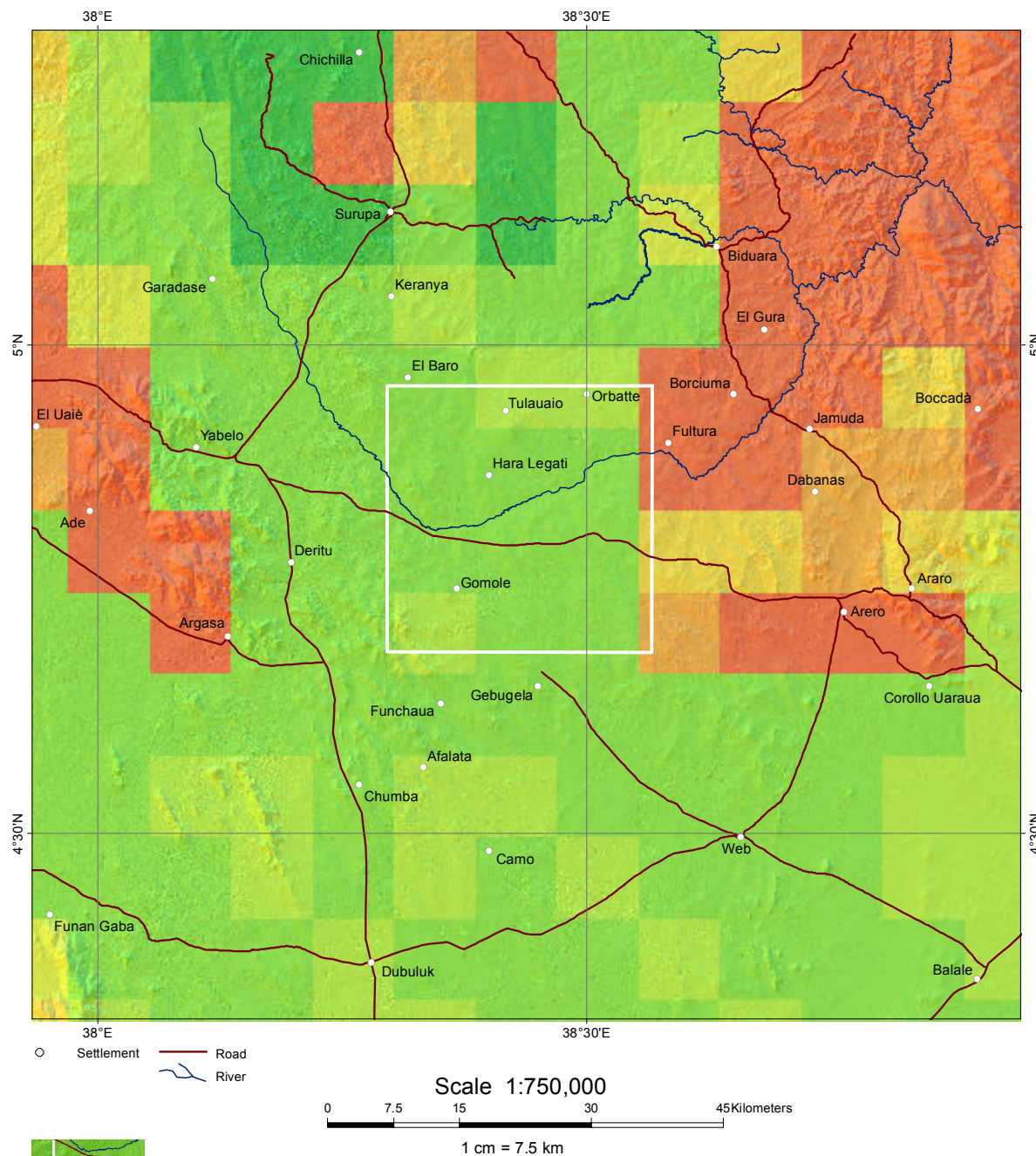


Length of Growing Period (Days)



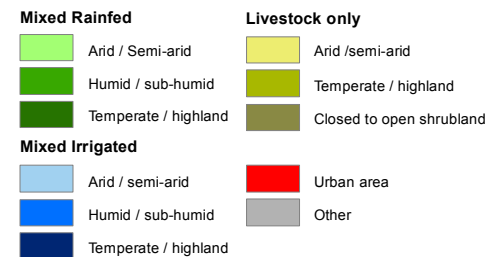
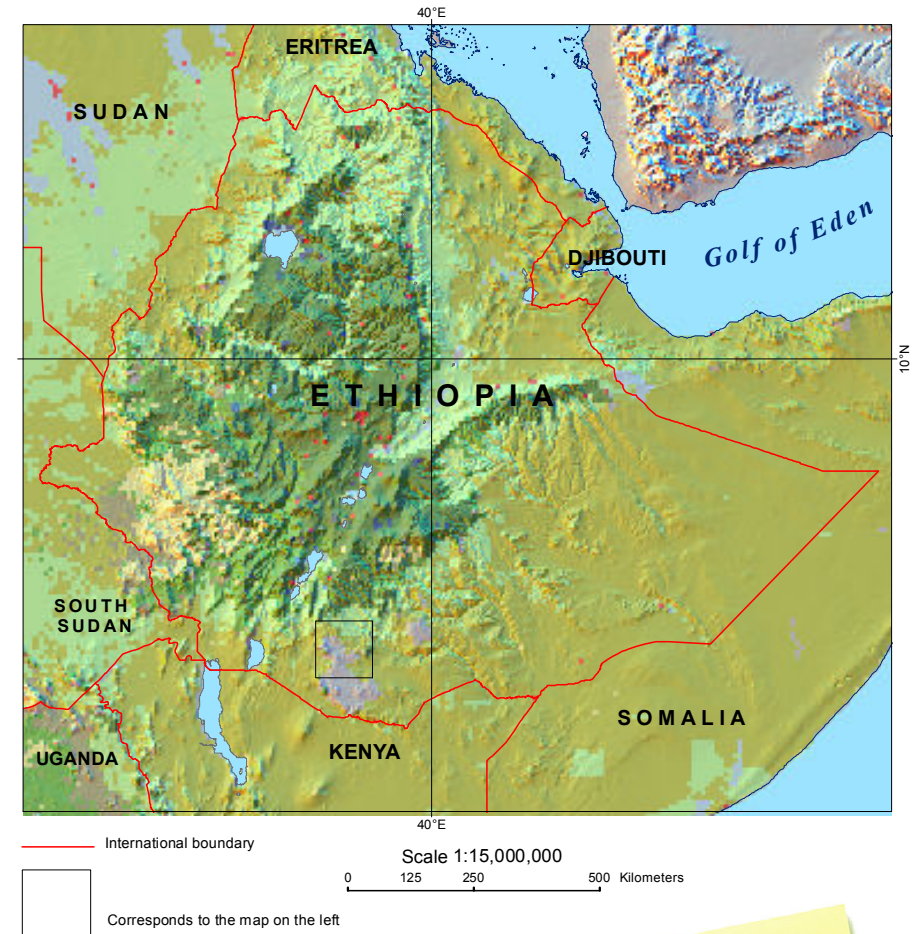
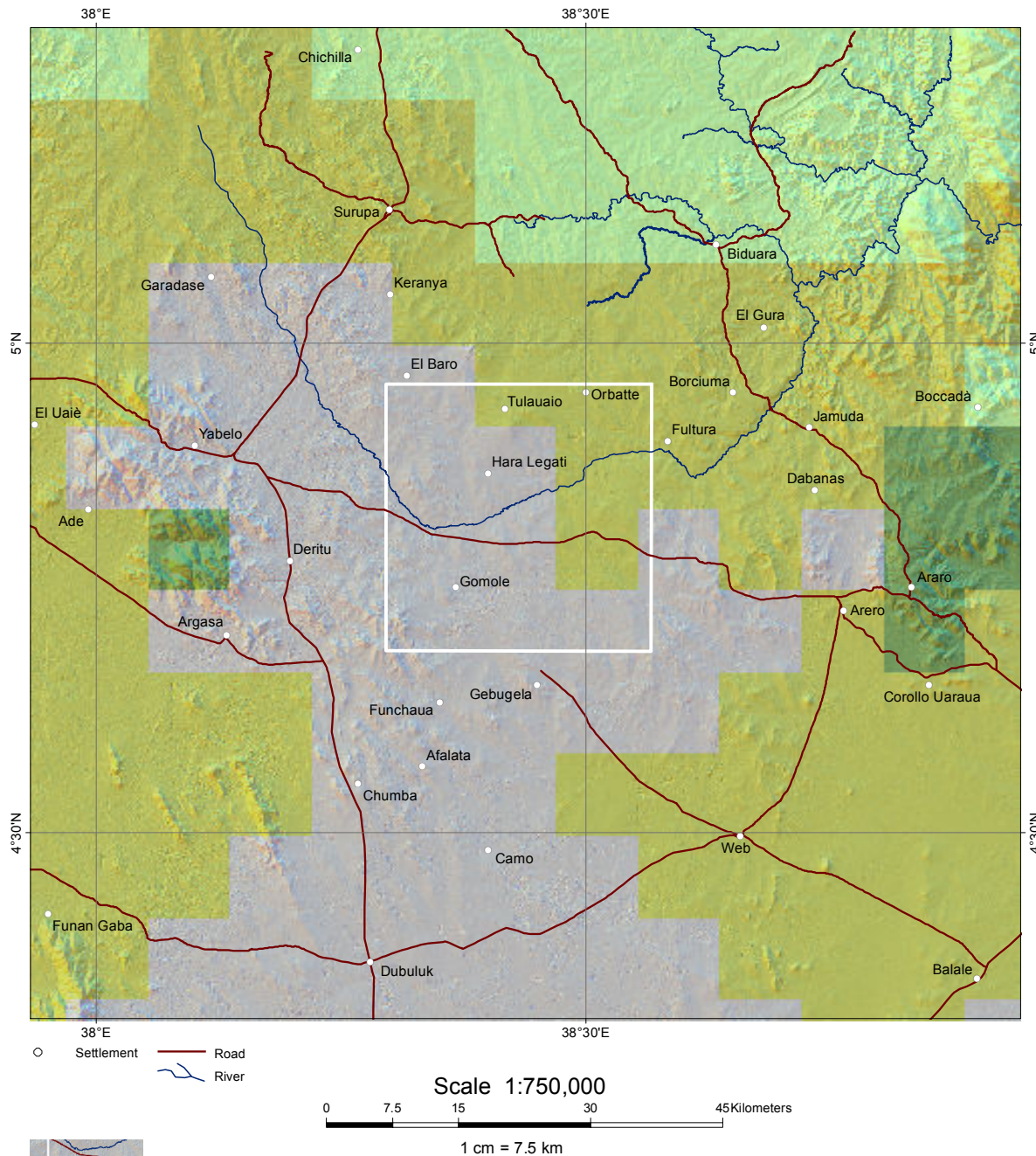
The Length of Growing Period (LGP) is defined as the number of days in a year during which there is available rainfed soil moisture supply for plant growth; here modeled for 2030.

Crop Suitability



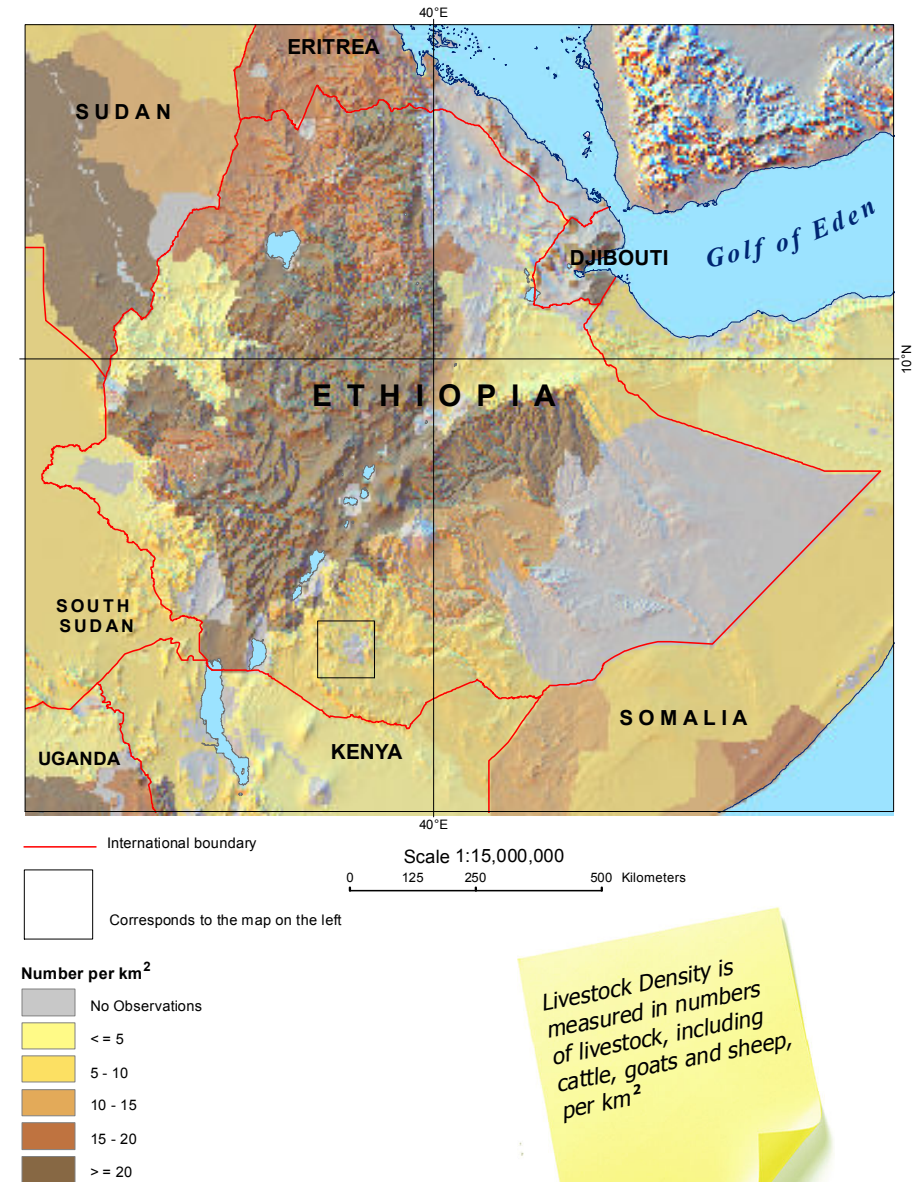
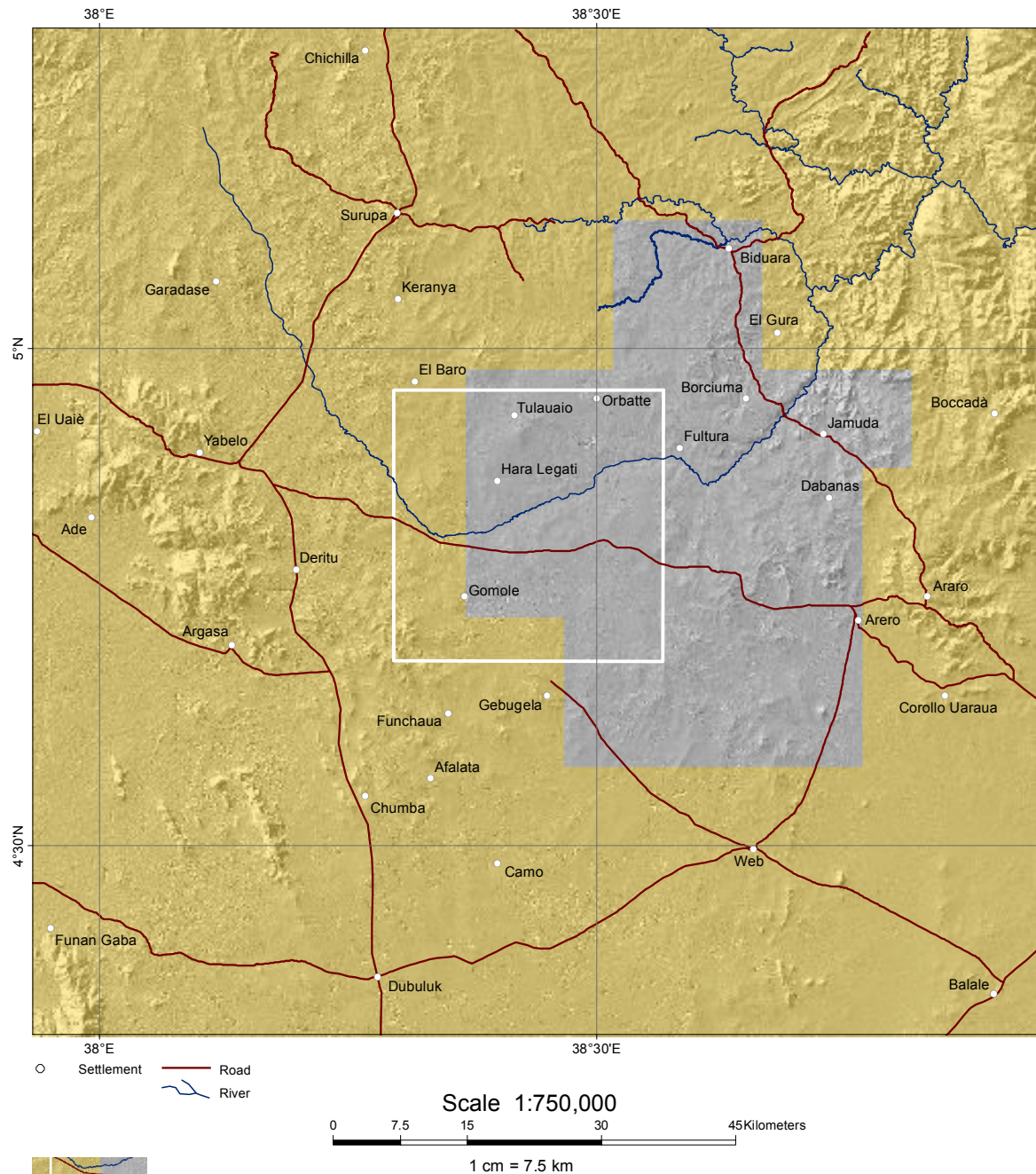
Crop Suitability refers to the land resource assessment that considers agricultural land use options with relevant agro-ecological condition to estimate expected cropping activities.

Livestock Production Systems



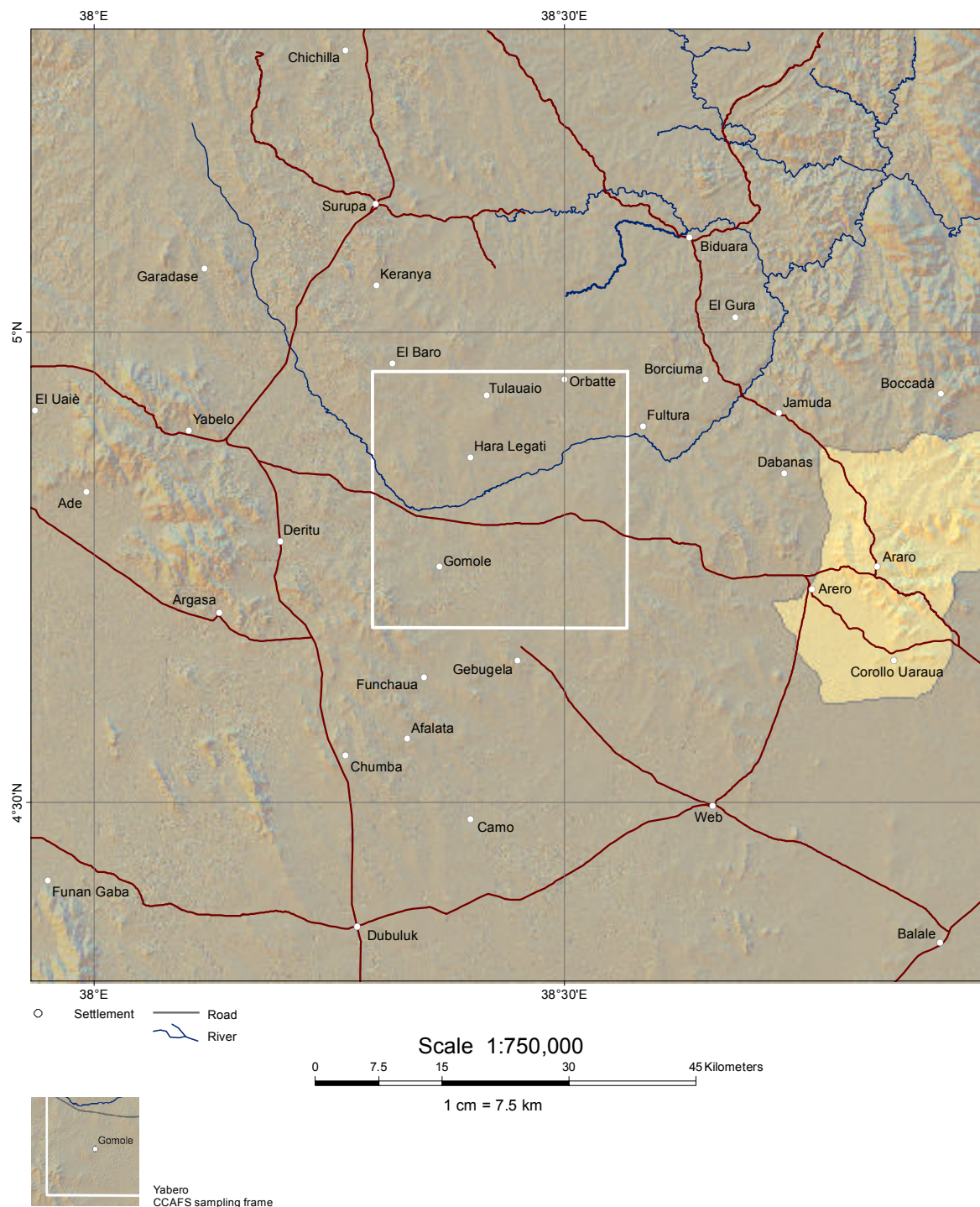
Livestock Production Systems as part of agricultural systems take agro-climatic conditions into account and are classified in terms of feed and livestock resources; livestock commodities produced; production technology; product use and livestock functions; area covered; geographic locations; and human populations supported.

Livestock Density



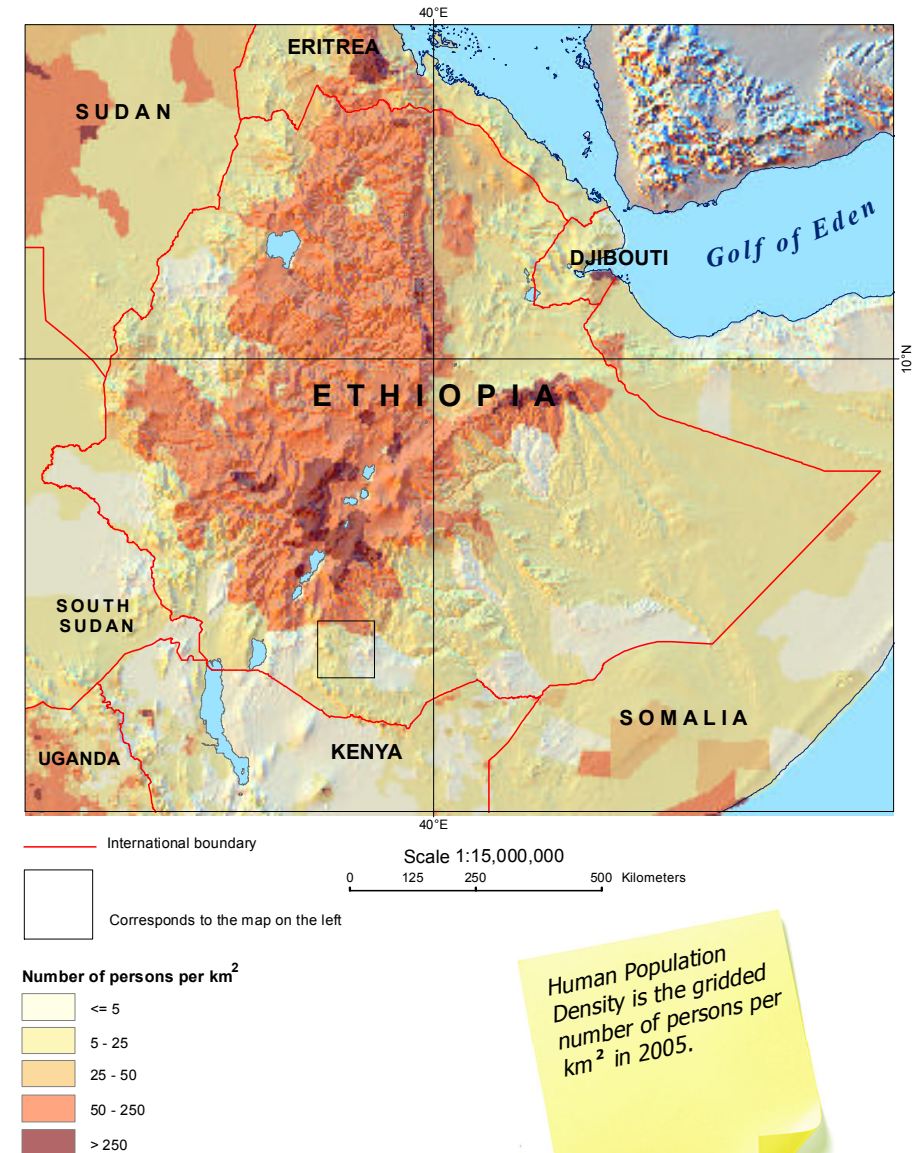
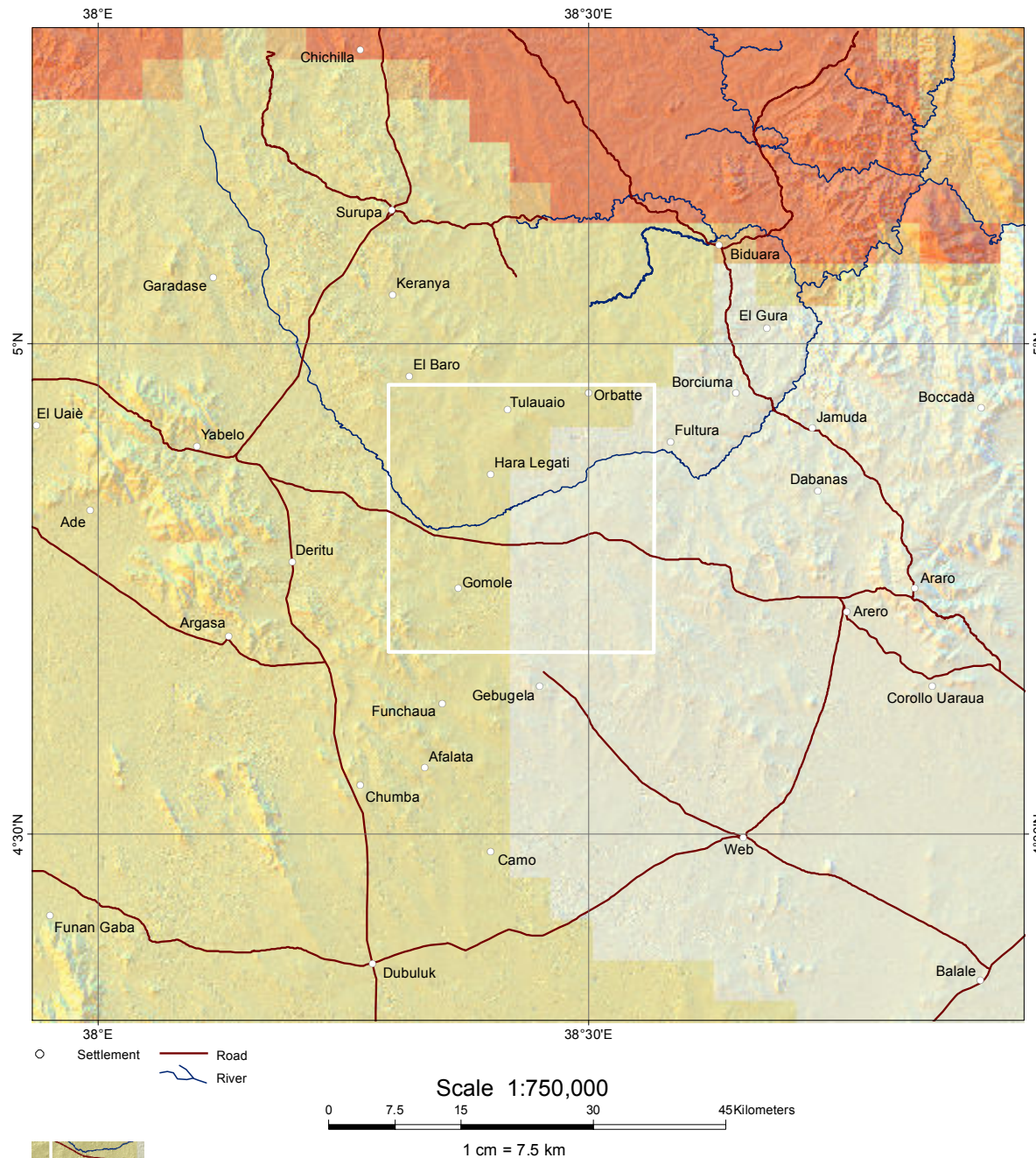
Livestock Density is measured in numbers of livestock, including cattle, goats and sheep, per km²

Livelihood Zones



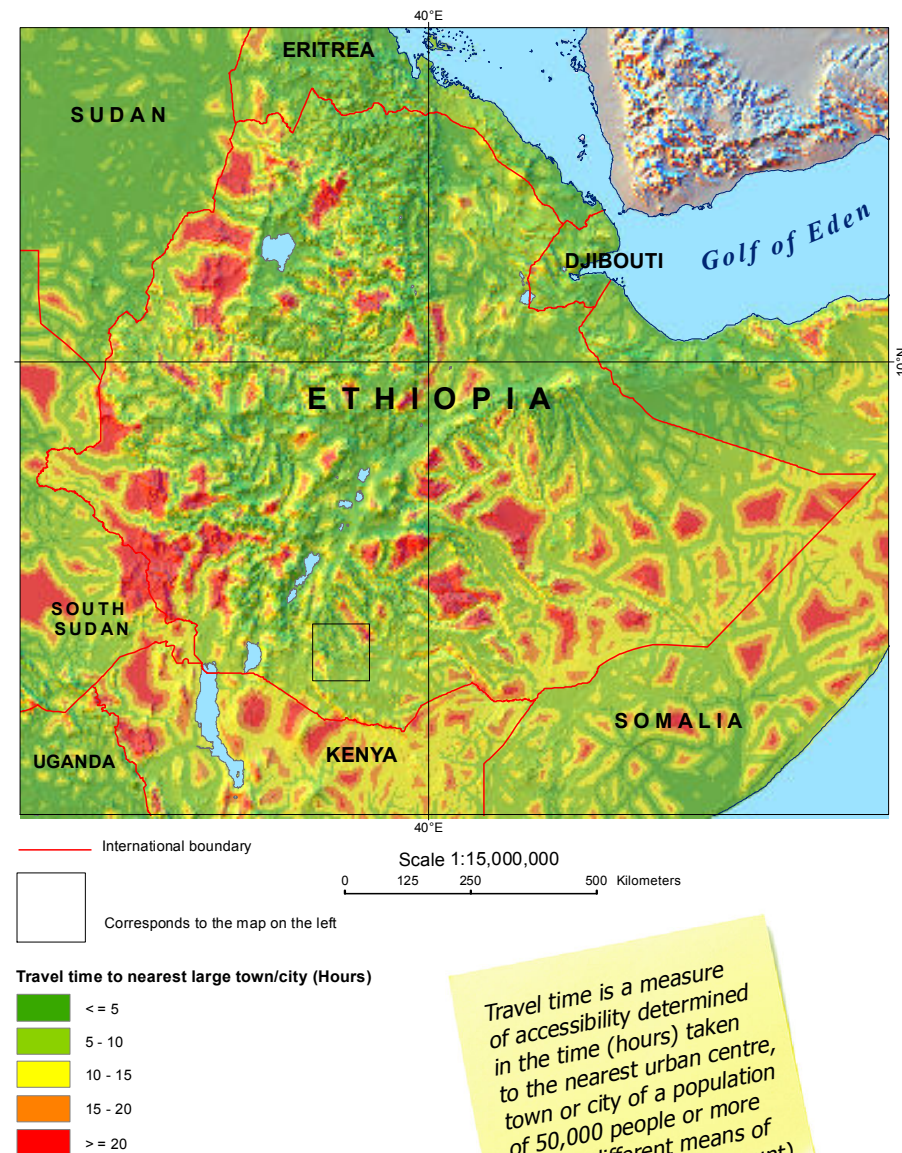
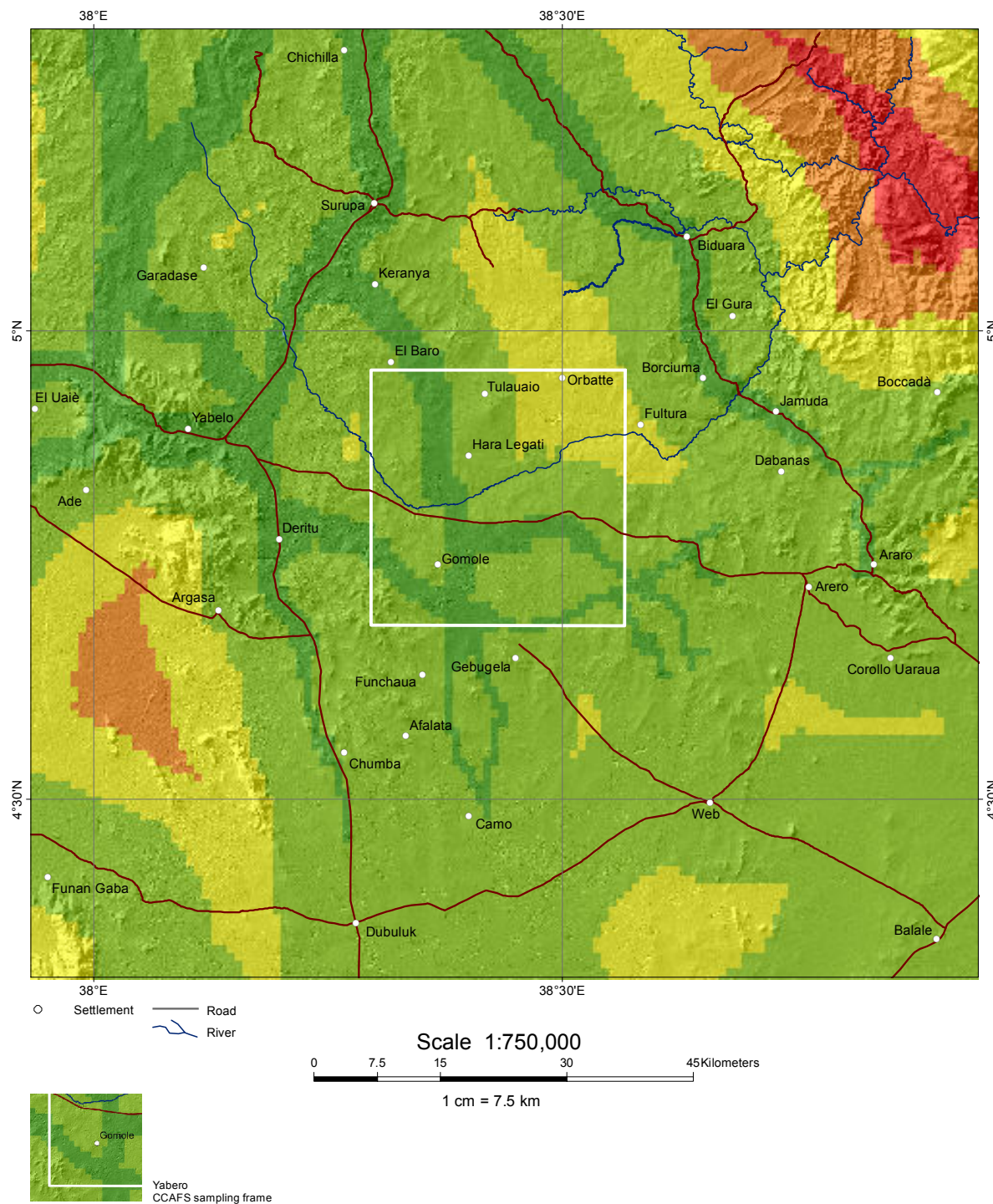
Livelihoods are complex and shaped by a variety of factors. These livelihood zone maps delineate geographic areas within which people broadly share the same livelihood patterns including access to food, income, and markets.

Human Population Density

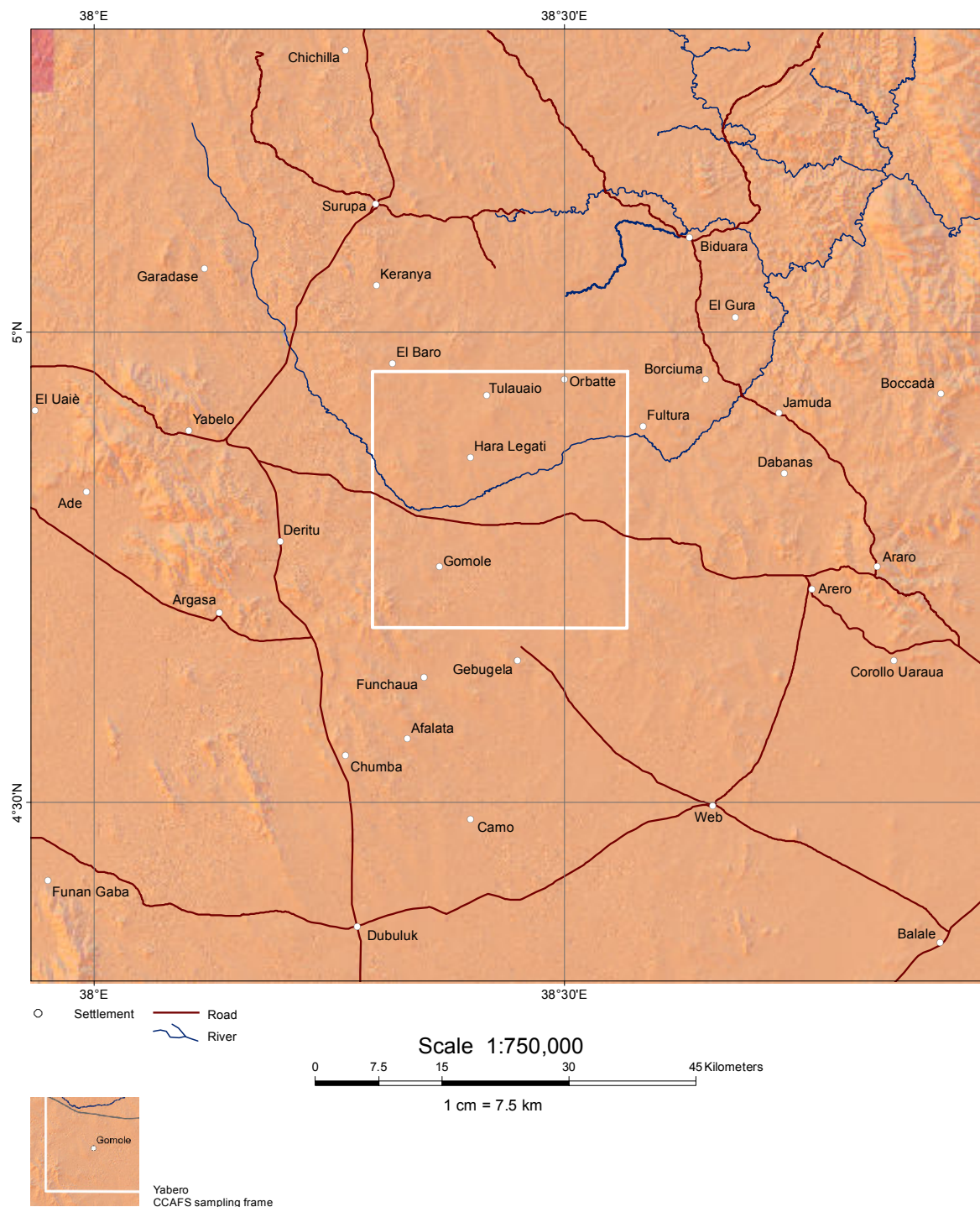


Human Population Density is the gridded number of persons per km² in 2005.

Market Access

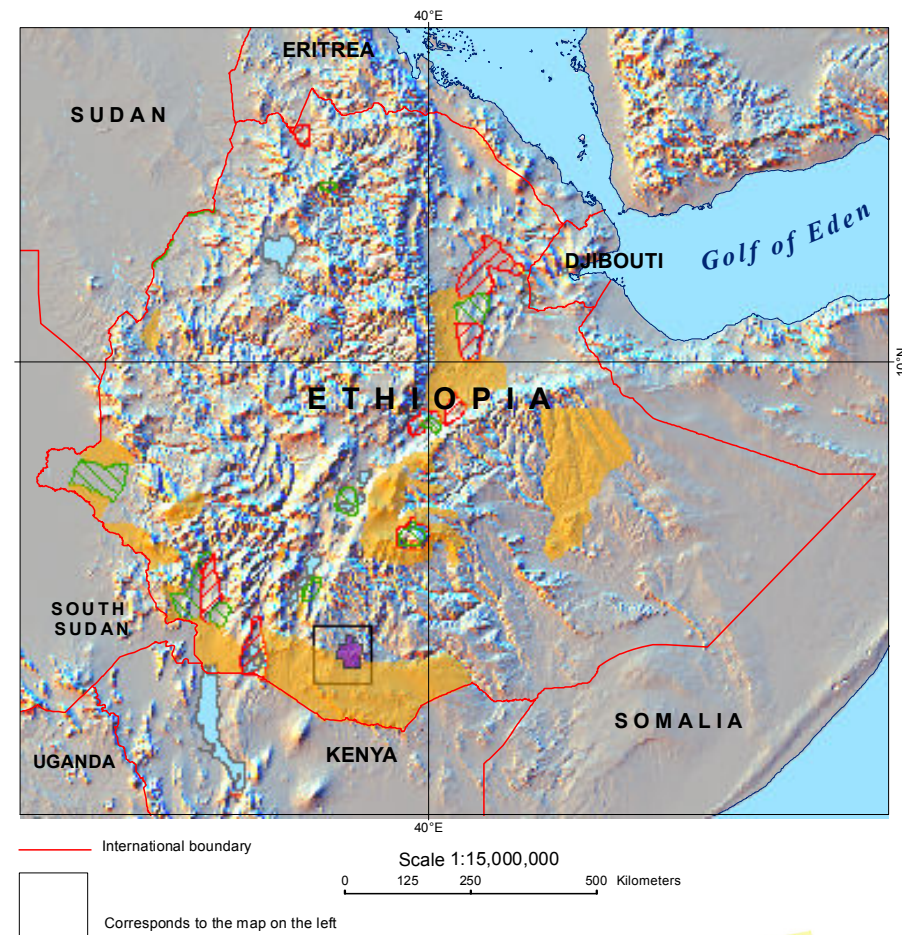
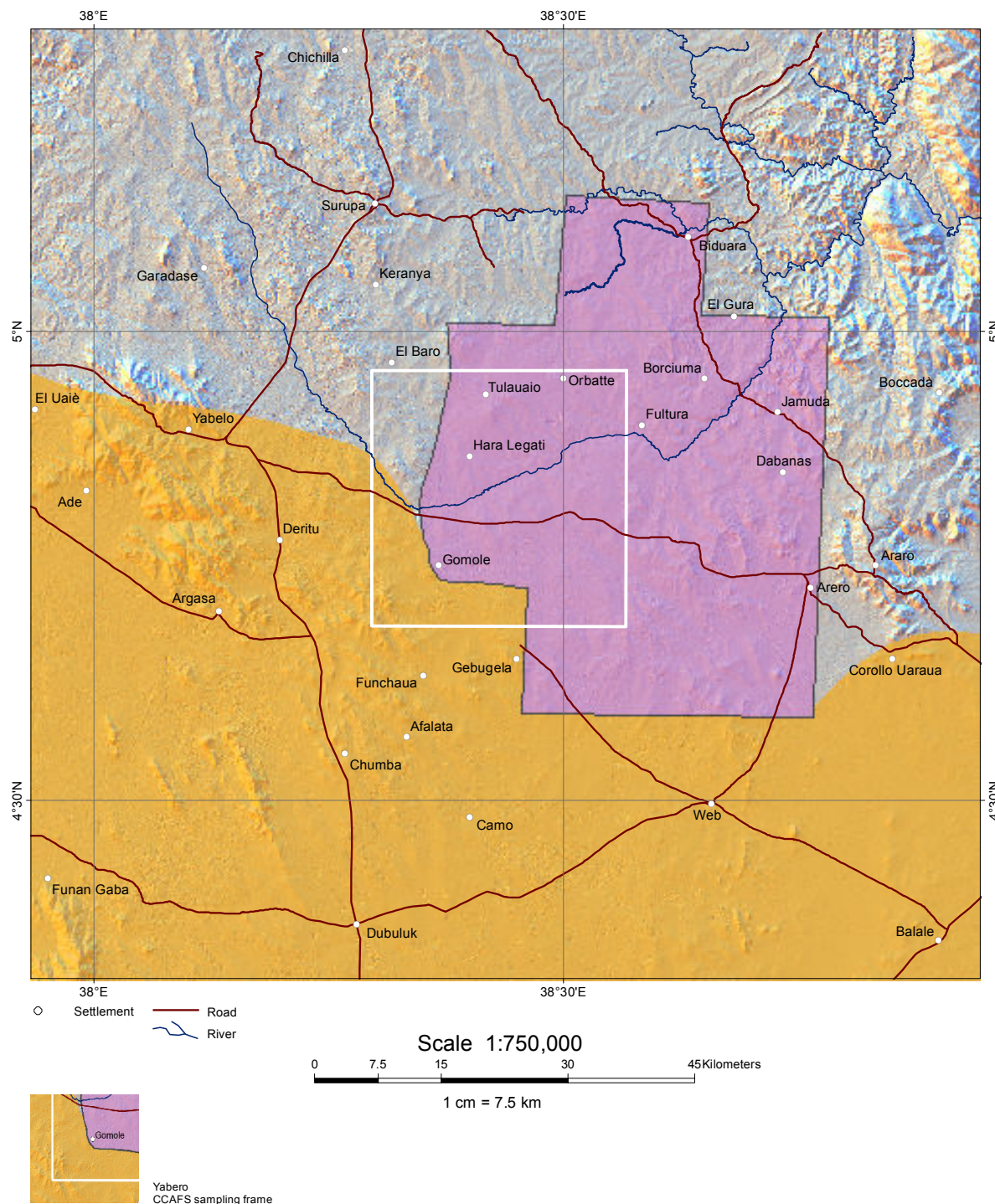


Travel time is a measure of accessibility determined in the time (hours) taken to the nearest urban centre, town or city of a population of 50,000 people or more (taking different means of transportation into account)



CIESIN constructed global datasets of poverty that are based on estimate of subnational infantmortality and child malnutrition data, recognizing that both are proxies for poverty and welfare rather than direct measures.

Conservation Areas



- Conservation Areas**
- Controlled Hunting Area
 - Sanctuary
 - National Park
 - Wildlife Reserve

Conservation Areas represent protected areas that, according to IUCN, are clearly defined geographic spaces, recognized, dedicated and managed through legal or other effective means, to achieve long-term conservation of nature with associated ecosystem services and cultural value.

References and Data Sources

Regional Map

Sijmons K. 2013a. Digital Satellite Image based on, MODIS (Moderate Resolution Imaging Spectroradiometer) NASA, 2009, Ground resolution : 1 Kilometer. GTOPO30, (DEM) Global Digital Elevation Model U.S Geological Survey, Ground resolution: 1 Kilometer. Topographic Features derived from: Global GIS, U.S. Geological Survey and Google Earth. Projection: Geographic, Lat/Long, WGS84

Topographic Map

Sijmons K. 2013b. Relief representation derived from Digital Elevation Model (DEM) of SRTM (Shuttle Radar Topographic Mission) 2000, Ground resolution 90 meter and ASTER GDEM, Ground resolution 30 meter, NASA. Topographic Features digitized from Google Earth Projection: Geographic, Lat/Long, WGS84

Satellite Image

RapidEye Satellite Image, 5 meter ground resolution, Image acquisition, 17-01-2011

Annual Rainfall

Hijmans, R.J., S.E. Cameron, J.L. Parra, P.G. Jones and A. Jarvis, 2005. Very high resolution interpolated climate surfaces for global land areas. International Journal of Climatology 25: 1965-1978.

Annual Rainfall Graph

Jones P G, Thornton P K, Diaz W and Wilkens P W. 2002. MarkSim, a computer tool that generates simulated weather data for crop modeling and risk assessment. Version 1, 2002. CD-ROM and Users Manual. CIAT, AA6713, Cali, Colombia, 87 pp.

Annual Temperature

Hijmans, R.J., S.E. Cameron, J.L. Parra, P.G. Jones and A. Jarvis, 2005. Very high resolution interpolated climate surfaces for global land areas. International Journal of Climatology 25: 1965-1978.

Annual Temperature Graph

Jones P G, Thornton P K, Diaz W and Wilkens P W. 2002. MarkSim, a computer tool that generates simulated weather data for crop modeling and risk

assessment. Version 1, 2002. CD-ROM and User's Manual. CIAT, AA6713, Cali, Colombia, 87 pp.

Aridity Index

Trabucco, A., and Zomer, R.J. 2009. Global Aridity Index (Global-Aridity) and Global Potential Evapo-Transpiration (Global-PET) Geospatial Database. CGIAR Consortium for Spatial Information. Published online, available from the CGIAR-CSI GeoPortal at: <http://www.csi.cgiar.org/>

Altitude

Jarvis, A., H.I. Reuter, A. Nelson, E. Guevara, 2008, Hole-filled SRTM for the globe Version 4, available from the CGIAR-CSI SRTM 90m Database. Available at <http://srtm.csi.cgiar.org>

Soil Type

FAO/IIASA/ISRIC/ISS-CAS/JRC. 2009. Harmonized World Soil Database (version 1.1). FAO, Rome, Italy and IIASA, Laxenburg, Austria.

Agro-Ecological Zones

Fischer, G., F. Nachtergaele, S. Prieler, H.T. van Velthuisen, L. Verelst, D. Wiberg, 2008. Global Agro-ecological Zones Assessment for Agriculture (GAEZ 2008). IIASA, Laxenburg, Austria and FAO, Rome, Italy

Landcover

Arino, O., Perez J. R., Kalgirou V., Defourny P., Achard F. 2009. GlobCover. Version 2.3 Global. Accessed at <http://ionia1.esrin.esa.int/>

Landuse

Nachtergaele F., Petri M., 2010. Mapping Land Use at global and Regional Scales for Land Degradation Assessment Analysis (LADA).Version 1.1. LADA Project FAO/UNEP GEF/. <http://www.fao.org/geonetwork/srv/en/metadata.show?id=37139&currTab=simple>

Length of Growing Period 2000

Thornton P K, Jones P G, Owiyo T, Kruska R L, Herrero M, Kristjanson P, Notenbaert A, Bekele N and Omolo A, with contributions from Orindi V, Adwerah A, Otiende B, Bhadwal S, Anantram K, Nair S and Kumar V. 2006. Mapping climate vulnerability and poverty in Africa. Report to the Department for International Development, International Livestock Research Institute, Nairobi, Kenya, 200 p.

Length of Growing Period 2030

Thornton P K, Jones P G, Owiyo T, Kruska R L, Herrero M, Kristjanson P, Notenbaert A, Bekele N and Omolo and Kumar V. 2006. Mapping climate vulnerability and poverty in Africa. Report to the

Department for International Development, International Livestock Research Institute, Nairobi, Kenya, 200 p.

Crop Suitability

FAO-IIASA 2007. Mapping biophysical factors that influence agricultural production and rural vulnerability. Food and Agriculture Organization and International Institute for Applied Systems Analysis, Rome 2007.

Livestock Production Systems

FAO. 2007. Gridded livestock of the world 2007, by G.R.W. Wint and T.P. Robinson. Rome, pp 131.

Livestock Density

Wint W, Robinson T, 2007. Gridded Livestock of the World. FAO, 131 pp.

Livelihood Zones

Livelihood Zone Products. Famine Early Warning Systems Network (FEWS NET). Accessed at <http://www.fews.net/pages/livelihoods.aspx?loc=6&l=en>.

Human Population Density

Center for International Earth Science Information Network (CIESIN)/Columbia University, and Centro Internacional de Agricultura Tropical (CIAT, 2005. Gridded Population of the World, Version 3 (GPWv3): Population Density Grid, Future Estimates, Edition: 3.0. NASA Socioeconomic Data and Applications Center (SEDAC. Online_Linkage: <http://sedac.ciesin.columbia.edu/data/set/gpw-v3-population-density-future-estimates>

Market Access

Nelson, A. (2008) Estimated travel time to the nearest city of 50,000 or more people in year 2000. Global Environment Monitoring Unit - Joint Research Centre of the European Commission, Ispra Italy. Available at <http://www.tem.jrc.it/accessibility> (accessed 06/03/2004)

Poverty

Center for International Earth Science Information Network (CIESIN), Columbia University, 2005. Small Area Estimates of Poverty and Inequality (SAEPI) database. Palisades, NY: CIESIN, Columbia University. Available at <http://www.ciesin.columbia.edu/povmap>. (Version 1.0) Available at <http://sedac.ciesin.columbia.edu/theme/poverty>

Conservation Areas

UNEP-WCMC (2012). Data Standards for the World Database on Protected Areas. UNEP-WCMC: Cambridge, UK.

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) brings together the world's best researchers in agricultural science, development research, climate science and Earth System science, to identify and address the most important interactions, synergies and tradeoffs between climate change, agriculture and food security. CCAFS is a strategic partnership of CGIAR and Future Earth, led by the International Center for Tropical Agriculture (CIAT).

For more information, visit www.ccafs.cgiar.org and www.geomapa.nl



RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security

